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THE SURGICAL CLINICS
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Volume 3 Number 4

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

PANCREATIC CYST

Patient Presenting a Large Abdominal Tumor Extending from the Ensiform Cartilage to About Midway Between the Umbilicus and the Symphysis. History as Recorded on Dr. Sippy's Service. Operation Revealed a Cyst of the Pancreas. Discussion of Pancreatic Cysts and the Treatment Employed for Their Relief.

THIS patient, a man of fifty-five, has been referred to my service with a huge abdominal tumor. The case offers a very interesting problem in diagnosis. The patient has been under the care of Dr. B. W. Sippy for a number of months, and from the history taken on Dr. Sippy's service I present to you this summary:

A man, J. M., fifty-five years of age, came to Dr. Sippy's service March 27th complaining of distress in the abdomen and a tumor in the abdomen. The patient stated that he had been troubled with abdominal distress for twenty-five years. This has been coming on at irregular intervals all this time. The longest period that he has been free from distress is for a period of two or three years. At times he would have short periods of freedom for a month or two. All the attacks have been somewhat similar in character. These attacks have been characterized by distress in the abdomen and acute pain. The pain, however, was never so acute that he had to go to bed until a recent attack, at which time he was in bed for several weeks with a temperature varying from 99° to 101° F. He had gotten in the habit of taking bismuth and chalk to relieve his distress. Very often this would do so. On the other hand, at times he would fail to obtain relief. Describing a typical day, one in which he had no attack, he stated that he would feel first rate when he got up in the morning before he ate his breakfast. After he ate an ordinary breakfast some distress would come on about 10 o'clock in the morning and it would continue until noon time; when he took his lunch it would be followed by relief. He might then have distress at 3 or 4 o'clock in the afternoon. This would continue until he ate his supper, which would again give him relief. After supper the distress would come on about 10 o'clock at night. He would usually take some bismuth and chalk and with one or two doses he would obtain relief, all of this sounding very much like the chemical pain of hyperacidity or of a duodenal or gastric ulcer. About six months ago he had a severe attack of acute pain for which he consulted a physician, who gave him some morphin for relief. This first attack was followed by a number of subsequent attacks which were relieved with morphin. Two weeks after he had this attack he first noticed a tumor in his abdomen. He states that this has not given him any symptoms. He has, however, lost 25 pounds since these severe attacks occurred last October.

A general examination fails to reveal facts which would throw any light upon the case. On physical examination there is found a large mass completely filling the space from the ensiform to well below the umbilicus and causing a great forward bulging of the upper portion of the abdomen. This mass is round, perfectly smooth on the surfaces which are accessible to palpation, not tender, and moves to a moderate degree with respiration. The mass is raised with each heart beat, apparently from contact with the abdominal aorta. No lateral expansion or pulsation is present. The mass extends somewhat more to the left side than to the right. The liver and spleen are not palpable. There are no other palpable masses in the abdomen. The patient at this time had no temperature. Hemoglobin was 80 per cent. and leukocytes 8500. There was no blood in the stools.

At this time a diagnosis of abdominal tumor, probably a fibroid growth of the mesentery, was made and the patient asked to return for further examination. In order to eliminate a possible kidney lesion a pyelogram was made which did not furnish any evidence of value.

The patient was continued under observation with a probable diagnosis of fibroid of the mesentery. He continued to lose weight and strength, until up to the time of operation he had lost about 50 pounds in weight and was in such weakened condition that he had to give up his work.

When he came to the hospital a few days ago I found the condition very much the same as that furnished in Dr. Sippy's case record, with this exception, the tumor had evidently grown a great deal in size and now extended from the ensiform cartilage to about midway between the umbilicus and the symphysis and filled the abdomen almost completely, extending, however, more to the left than to the right side.

The outstanding facts obtained from this history are, as you have noted, first, the presence of a huge abdominal tumor filling almost the entire abdomen, developing in the course of several years gradually and with few symptoms beyond a gradual loss of weight and strength and an occasional acute colic attack. We find no definite lesion of any of the abdominal viscera. The tumor occupies the center of the abdominal cavity and anatomically may spring from the omentum, the mesentery, or the pancreas. There is no evidence of interference with pancreatic function, such as fatty stools and the presence of diabetes.

The physical examination of the abdomen gives one the impression that the tumor is partly solid and partly cystic, or if it is entirely cystic, a cystic tumor with very strong walls containing fluid under a good deal of pressure. The *x*-ray has not given us any helpful evidence in making a differential diagnosis. My clinical diagnosis before opening the abdomen is a cyst of the omentum or mesentery or cyst of the pancreas.

There is no contraindication to a general anesthetic and

Dr. Herb has, as you have seen, given the patient a sequence of gas and ether without any preceding hypodermic of morphin. I shall make an incision in the middle line extending from the ensiform to quite well below the umbilicus. The peritoneal cavity is now open and the picture which is presented is rather confusing. The tumor mass presents itself, bulging out of the incision (Fig. 392). It seems to be a cyst with very thick walls. As I examine the anterior wall, however, what seems to be the cyst wall is in fact the stomach, which is plastered in front of the last cyst. The stomach is thinned out and drawn over the anterior wall. The anterior and posterior walls of the stomach here are in contact and this part of the stomach does not con-

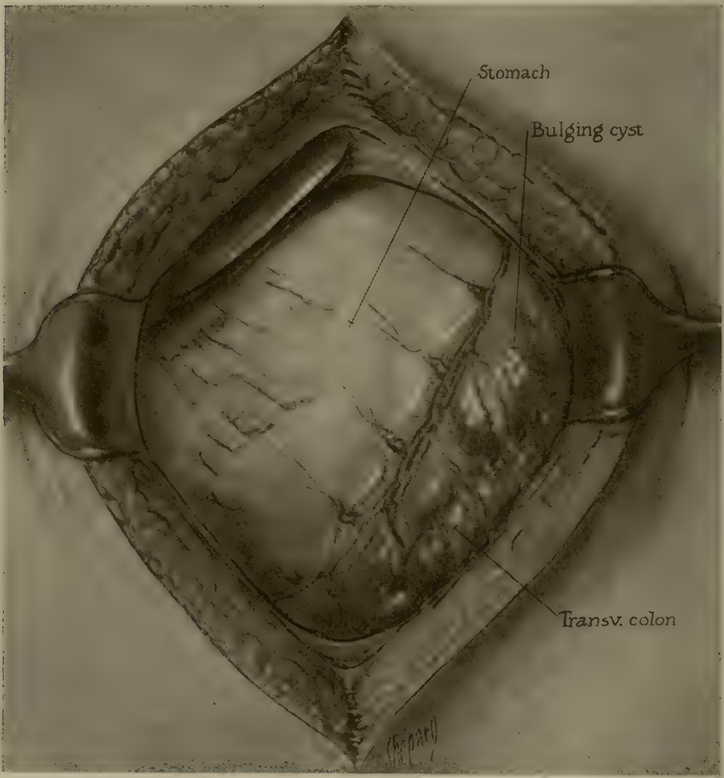


Fig. 392.

tain any gas or air. On careful examination, however, one can be sure of these facts, as the great omentum takes its origin from the great curvature of the stomach and one can distinctly see the vessels of the greater curvature running into the great omentum at this point. Following along the greater curvature to the liver high up in the abdomen I find an area in which I can expose the wall of the cyst by tearing a small opening in the great omentum. I introduce a good-sized needle on a large hypodermic syringe into the cyst at this point and draw out a brownish fluid. At this same point I introduce a large trocar, such as we employ for ovarian cysts, to which I have attached a rubber tube 4 or 5 feet in length and allow the contents of the cyst to pour into a basin on the floor beside the operating table. As the cyst empties itself you see that it contains about 2 gallons of this fluid (Fig. 393). From the location of the cyst and from this history, there being no history of trauma or previous inflam-

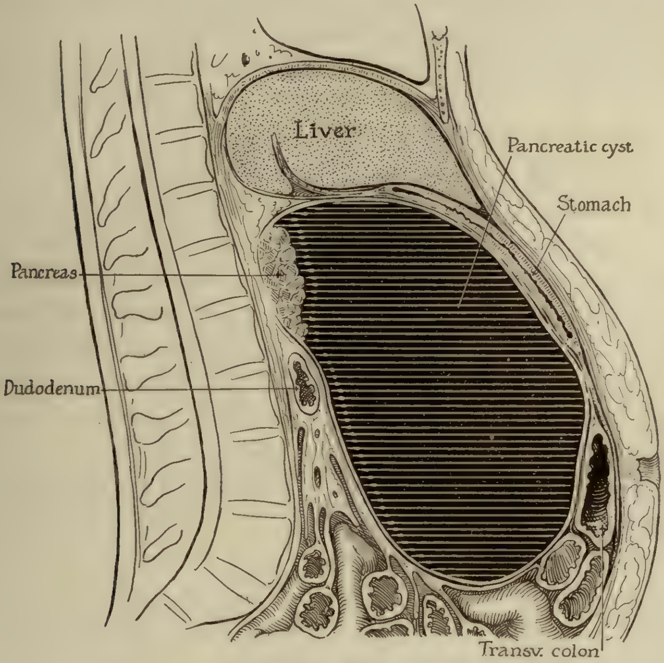


Fig. 393.

matory process, I think we must conclude that this is a true pancreatic cyst.

We must now decide what plan should be adopted in dealing with this particular case. Can we dissect out the cyst? Is such an operation possible? Should we close the peritoneal cavity down to this opening which we have made in the cyst wall, close the opening in the cyst wall temporarily and allow our abdominal incision to heal or at least the plastic peritonitis to wall off the cyst from the rest of the abdominal structures before we institute drainage, or shall we provide complete drainage at this primary operation? I shall first of all try to dissect out the cyst wall for a considerable extent and determine whether or not extirpation is feasible. Enlarging the trocar opening so that I can introduce my hand into the interior of the cyst I carefully empty out all of the fluid contents of the cyst and explore the interior. I find in the bottom of the cyst a handful of peculiar material, which I now bring into view, which looks like a grayish mud. This is débris from the lining membrane of the cyst. This condition has been reported a number of times in pancreatic cysts, and is therefore in this instance confirmatory of such a diagnosis. In the upper right-hand corner of the cyst cavity I find there is a mass of this débris which is so adherent to the interior wall of the cyst that I hesitate to use enough force to remove it, being afraid that I shall do some damage to the pancreas or bring on some hemorrhage. With one hand inside the cyst cavity I now begin to peel off the stomach from the anterior cyst wall. I find that the stomach and the cyst are plastered together by very firm adhesions, and in attempting to separate the stomach completely from the cyst I make a small opening in the stomach, tearing an opening about ½ inch long in the mucosa. I proceed to repair this at once with three rows of sutures. I find that I can separate the lower portion of the cyst, that is, the portion below the stomach, easier than I can the portion covered by the stomach, and you see now that I have brought into view, so I can bring it out of the field beyond my abdominal incision, 3 or 4 inches of the cyst wall. You notice the wall is about ¼ to ⅓ inch thick and so far we have not had any hemorrhage of any moment from our manipulations in freeing the cyst. It is evident, however, that it would be impossible to dissect out this entire cyst without removing the pancreas at the same time and, of course, this is out of the question. I shall, therefore, bring the cyst wall out through the center of my abdominal incision, close the rest of the abdominal incision, and drain the cyst (Fig. 394). You will notice that I make the closure of the abdominal wall with six sets of button tension sutures. After closing the peritoneum up to the cyst from below and down to the cyst from above I stitch the cyst wall to the skin with some black silk sutures and introduce into the cyst 2 large split rubber tubes and some iodoform gauze. From my experience with these pancreatic cysts I am very sure that one of the important pieces of technic is covering the integument of the entire abdomen with a thick layer of sterile zinc-oxid paste because the fluid from most of these cysts has a very powerful digestive action on the integument and produces very destructive lesions which may be serious or even fatal. The patient's general condition is good. I shall simply order normal salt retention enemas, 8 ounces every four hours, and ¼ grain morphin hypodermically as soon as he wakes up. I see no reason why he should not be given good liquid nourishment the day after the operation.

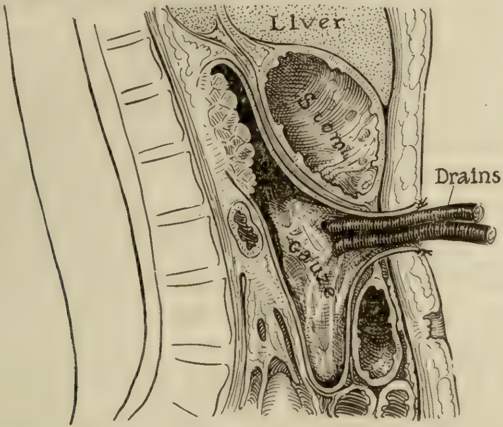


Fig. 394.

I am glad of the opportunity of showing you this case. This is the largest pancreatic cyst which I have operated upon and I think one of the largest that I have seen recorded. The pancreatic cysts which I have seen up to this time have none of them contained more than a gallon of fluid. The pancreas has within the last few years excited our interest and study. I think we have added a great deal to our knowledge of this particular field of research and are recognizing pancreatic lesions much more frequently than we did formerly. My former associate, Dr. Nicholas Senn, contributed one of the early pieces of work on the pancreas. His work consisted in attempting experimentally to produce pancreatic cysts by tying off the pancreatic duct. At that time there were practically no other pancreatic conditions which we recognized clinically. These cysts, of course, are exceedingly rare. Senn's work was followed a few years later by a contribution of Reginald Fitz, of Harvard, on acute pancreatitis. Then came the work of Mayo-Robson on chronic interstitial pancreatitis; then the work of Mikulicz on the importance of pancreatic injuries in abdominal work and the great necessity of providing thorough drainage in order to prevent the development of pancreatitis and hemorrhage if such injuries occur. Then came the very important work of Opie on the pancreas, demonstrating clearly the important relation of the pancreas and the islands of Langerhan to diabetes. Then abdominal surgeons all over the world, who were doing a large number of gall-stone cases, began to recognize the frequency of pancreatic lesions in gall-stone cases, especially common duct cases. Then came the effort of clinicians to find some laboratory tests which would enable us to differentiate pancreatic lesions from other lesions in the abdominal cavity, notably the work of Cammidge. And now the last year we have all been greatly interested in the splendid work of Banting, McLeod, and their associates at Toronto, in discovering insulin and their demonstration of the great potency of this agent in diabetes. Although the pancreatic lesions still remain in some ways obscure, we are gradually unraveling the mystery that heretofore surrounded them.

Taking this case as a basis I want to refer to several other clinical experiences which I have had with pancreatic lesions, which I hope may be interesting and instructive.

Four or five years ago I operated upon a patient for gall-stones in both the gall-bladder and common duct. He made an excellent recovery from the operation and returned to his work. About two years later, however, he was seized with acute abdominal pain and was brought again to the hospital. I found that he had a high temperature, was very septic, had a mass in the upper abdomen in the middle line which was very painful and very tender on pressure. Under a local anesthetic I opened the midline and came down to a large abscess which had developed in such a way as to push the stomach upward and the transverse colon downward and which came to the surface between these two viscerad. The visceral and parietal layers of the peritoneum were adherent at this point. I opened the abscess with a closed pair of artery forceps and a quart or more of pus escaped and with it some sloughing tissue, probably fragments of the pancreas. My technic was not very good because in attempting to mop out the pus from the cavity I produced a rather sharp hemorrhage, and I was compelled to pack the abscess cavity with a large amount of iodoform gauze in order to control the bleeding. I mention this because I think it was an error in technic. I should have been satisfied with simply introducing some drainage-tubes and allowing the pus to escape. Fortunately, however, the man went on to recovery. Within the last year, however, he has developed a grave degree of diabetes and is probably, unless we can save his life with the new agent insulin, doomed to early fatal termination. This case illustrates the relationship between the gall-bladder and resulting infection of the pancreatic duct and pancreatic disease and the destruction of so large a portion of the pancreas as to produce diabetes.

I desire to mention a second case, illustrating the traumatic element in these cases. A boy was wrestling in a gymnasium with a school-fellow and received a severe blow in the pit of the stomach. This was followed by marked evidence of shock which lasted for some hours. It was evidently followed by internal hemorrhage. Within twenty-four hours a distinct tumor could be felt in the upper half of the abdomen consistent with being a hemorrhage about the pancreas. After a short time sugar appeared in the urine. I mention this because I want to state that it is exceptional to find in pancreatic lesions the condition of diabetes. Of course, where it is found, it is very helpful in determining the diagnosis. The boy went on to recovery and partial or almost complete disappearance of the abdominal swelling took place, followed later, however, by a gradual development of a definite tumor mass in that region. Subsequent operation showed a pseudopancreatic cyst containing about 3 pints of fluid which was handled by drainage and which fortunately resulted in recovery.

We have had recently in our service at Presbyterian Hospital, in the hands of one of my colleagues, Dr. D. B. Phemister, another interesting pancreatic cyst which I shall briefly refer to, as it furnishes an illustration of another lesion which one must keep in mind. The patient was one of Dr. Ralph Brown's, and after a very careful analysis a clinical diagnosis of pancreatic cyst was made. One of the striking features was the evidence obtained by the *x*-ray, showing the stomach surrounding the right half of the cyst and shaped like a crescent, showing distinctly the fact that the stomach was pushed out from its position and changed into its crescentic form by extramural pressure. At operation a cyst in the pancreas was found, coming to the surface between the greater curvature of the stomach and the transverse colon, and contained about 3 pints of fluid of a brownish-red color. After withdrawing this fluid with a trocar a more careful examination could be made of the abdominal contents and Dr. Phemister could feel a carcinoma involving the head of the pancreas with secondary carcinomatous masses in the liver, the associated malignant disease, of course, making any thought of care of the pancreatic condition out of the question.

After-history.—Finally, I want to add a word in regard to the after-management of these pancreatic cyst cases and I can do this probably in no better way than relating the experience which we had with the case just reported. The patient went on to an excellent recovery. There was surprisingly little digestion of the abdominal wall by the fluid and I think in part this was prevented by our very free use of zinc-oxid paste. The patient made a very good operative recovery until after we had removed the sutures and then he developed a picture of chills and fever very characteristic of septic thrombophlebitis. There was no local evidence of infection and we were very fearful that septic thrombosis would extend and involve the portal vein and produce a fatal termination. Fortunately, however, it must have been simply a vein in the wall of the cyst, because after three or four chills the evidences of infection disappeared and the patient went on to a very rapid recovery and improvement in weight and strength. In sixty days the patient gained about 50 pounds in weight. A fair-sized drainage-tube was left in the cyst cavity. For some time after the operation considerable amounts of muddy débris were removed with a gall-bladder scoop, evidently that portion of the débris which was adherent to the wall and which I did not remove at the time of the operation. The interior of the cyst was irrigated with tincture of iodin in water, making a solution about the color of sherry wine, until it contracted. We then changed the irrigation to pure tincture of iodin, using it once every other day. There is still, six months after operation, a drainage-tube, the size of a No. 14 American rubber catheter, about 3 inches in length, in the fistulous opening. The amount of secretion varies, sometimes it is very great, saturating some very large dressings which are changed twice a day. It is necessary to still protect the abdomen with zinc-oxid paste. I felt that it was wise to maintain drainage for a considerable period of time, as in handling these cases our experience has been that if drainage is discontinued too early a redevelopment of the cyst may take place. There comes a time, however, when it is necessary to discontinue the drainage and desirable to do so, when the pancreatic ducts are carrying off the pancreatic secretion they formerly poured into the cyst. At any rate, I think one can theorize that such a condition does sometimes occur. I would, however, give you this warning that it is better to continue drainage for too long a period than to remove it too early, necessitating a reopening of the cyst with re-establishment of drainage. A suggestion has recently been made in this connection which may be worth while. It is a suggestion made by Wohlgemuth of placing the patient on an antidiabetic diet with the thought that the pancreatic secretions would be diminished, giving the fistula a better opportunity of closing. It is well to warn your patients not to be impatient in these cases and to remind them of the fact that the drainage may be maintained for six months or more.

ACTINOMYCOSIS OF THE KIDNEY

Patient Presenting the Clinical Evidence of Actinomycosis Which was Not Substantiated at the First Operation by Microscopic Examination of the Tissues. At Second Operation, Some Months Later, Colonies of Ray-fungus Found. Treatment in These Cases.

I WANT to present to you first this morning an unusual case which I presented some months ago to a society of genito-urinary surgeons. I made at that time a clinical diagnosis of actinomycosis. The case came into the hospital on the medical service and was carefully worked up by the internists and the men on my service who are doing the cystoscopic work. At that time the patient had what appeared to be a large perinephritic abscess and he had some blood in the urine. A pyelogram was made of the right kidney which threw no definite evidence on the diagnosis. He was septic, had a temperature and a high leukocyte count, and had lost a great deal of weight and strength. The condition had existed for several months when he was brought to the hospital. The thing that attracted my attention was the wooden-like infiltration of the abdominal wall. This was present in the right side. In the right lower quadrant there was a very definite mass to be felt which seemed to be in the abdomen, but which was covered by the abdominal wall that was infiltrated throughout and gave one the impression of being connected with the deep-seated mass. A similar mass was present in the right upper quadrant running along the margin of the costal arch. In the flank between the last rib and the crest of the ilium one could make out what seemed to be a large mass that gave one the sensation as though it were a perinephritic abscess. Here, too, the tissues between the last rib and the crest of the ilium were infiltrated and presented the wooden-like feeling of the abdominal wall. In this position there was a fistulous opening through which came a watery, purulent discharge.

Under gas-ether I made the usual oblique kidney cut and came down to a large, irregular abscess which was consistent with being a perinephritic abscess. It was filled with granulation tissue and some foul-smelling pus. In making at that time a clinical diagnosis of actinomycosis I emphasized the importance of a broad, general, surgical training for the specialist who was limiting his field to genito-urinary surgery and pointed to this case as an example. I requested my house surgeon to examine very carefully the granulation tissue and the discharges which we removed at operation. I expected confidently that they contain colonies of actinomyces. To my chagrin, however, the report came back that no colonies of actinomyces were found and that the pus had the appearance of being a degenerated hypernephroma. For a time I accepted that statement and placed the man under *x*-ray treatment, under which he improved somewhat.

Several months later, however, he came again into my clinic and the case impresses me so strongly from the clinical aspects as being actinomycosis that I immediately ordered him again into the hospital and cureted out some of the granulation tissue from the fistulous tract which I had enlarged at the time of the first operation, and in the very first section examined under the microscopic were found abundant colonies of actinomyces. Then I sent him to the operating-room and under gas-ether made a very radical operation, opening up the site of the first operation and the region of the kidney and in addition made a muscle-splitting incision down on to the indurated mass in the right lower quadrant which proved to be a deep-seated abscess with very thick, indurated walls, and in the pus we again found many colonies of the ray fungus.

With a knowledge of the definite pathology of the condition I felt very much more hopeful of curing the case and have put him on a scheme of management which we have followed out since 1905. In that year I began the use of copper sulphate in an intractable case of abdominal actinomycosis, using it both locally and internally, with a resultant cure, and I have been using the agent in combination with potassium iodid and x-ray since that date. We use the copper sulphate to irrigate fistulous tracts, using a 2 per cent. solution of copper sulphate, and we gave copper sulphate internally, $\frac{1}{4}$ grain in capsules three times a day. In addition we gave moderate doses of potassium iodid, not enough to upset the stomach or interfere with the general nutrition of the individual, limiting the dosage from 15 to 30 grains three times a day; in other words, in actinomycosis we use a mixed treatment of copper and potassium iodid, just as we use in cases of syphilis a mixed treatment of mercury and potassium iodid. In addition, I have been employing x-ray treatment in these cases very much as we have employed it in cases of granulomatous masses due to tuberculosis. I am very confident that this combination of copper, potassium iodid, and x-ray has given us very much better results than any other method that we have employed in ray fungus disease.

I want to call your attention to the fact that in such a case as I showed you this morning of actinomycosis involving the abdominal wall that the point of entrance of the organism is through the intestine. The organism gains entrance usually through the cecum or the appendix and extends from that atrium of infection radiating in all directions irrespective of tissues, involving organs and muscles, fascia and bone without apparently any selective action. We have had a large number of cases of actinomycosis on my service, somewhere between 50 and 60. When we began studying these cases carefully about twenty years ago the mortality in abdominal cases was very high, probably 70 or 80 per cent., almost all of them going on to a fatal termination. With the method of therapy which we have devised we have reduced that mortality to about 30 per cent. This particular patient is now in a rather advanced stage of the disease and yet I am hopeful that we shall be able to eradicate it and eventually restore him to health. My colleague, Dr. Dean Lewis, has recently had another case, somewhat similar to this, which, however, was in a very bad condition when he was admitted to the hospital and died within a short time, the postmortem showing an extensive actinomycotic involvement of the kidney. I want to emphasize the point that these cases of actinomycosis are as a rule overlooked, that the diagnosis is not made, and on that account the majority of the patients are not given the benefit of proper surgical and therapeutic management. I have had the same experience in a number of cases that we have had in this case, of having my younger men come back with a negative report after examining the tissue removed from a suspected case, and I have told them tnat they must keep constantly at the examination of the pus and granulation tissue, and then later they have had the satisfaction of finding colonies of ray fungus. I have been able in a number of cases to make an accurate clinical diagnosis of actinomycosis before we have obtained any microscopic evidence. I do not think this is surprising, for, as we all know, we do not hesitate to make a diagnosis of lupus vulgaris from the clinical picture of the lesion on the face without finding or expecting to find tubercle bacilli in the section of tissue removed. We all base the diagnosis on the clinical picture, and we can do the same to a more limited extent in cases of actinomycosis. The wooden-like infiltration involving a wide territory independent of the character of the tissues and the appearance of fistulous tracts lined with granulation tissue, the fact that there is no glandular involvement as in many of our chronic inflammations, the characteristic picture in the head cases of actinomycosis and in the abdominal cases, point very often very strongly to the correct diagnosis.

KIDNEY STONE

Demonstration of a Solid Tumor of the Kidney Removed from a Patient on Whom a Preoperative Diagnosis of Splenic Leukemia Had Been Made.

Operation on a Patient for Stones in Kidney. History, Diagnosis, and Operative Findings. Examination of Kidney After Removal. Peculiar Stone Formation Found. Presentation of a Specimen from a Similar Case in which a Growth of Bone was Found in the Kidney Stone.

Before I operate upon a kidney stone case this morning I want to present to you a specimen which I removed at operation last week, which is another illustration of the difficulties of diagnosis in the abdominal tract, and which teaches, I think, a very valuable lesson.

I was called to operate upon a case which had been carefully analyzed and studied and in which a diagnosis of splenic anemia had been made. The patient had a tumor in the left side of the abdomen which seemed to be an enlarged spleen. There was great loss of weight and strength and there was evidence of secondary anemia. Careful analysis of the case from an *x*-ray standpoint seemed to show that on filling the colon with barium solution this tumor would override the colon as we would expect a splenic tumor to do. Careful examination of the urine showed no evidence of blood or any other abnormality. The case had been seen by a number of medical men and they were all agreed that it was a case of splenic anemia. Because I had been interested in this particular field I was selected as the surgeon to do a splenectomy for the patient. When I examined the patient I found she was a small woman weighing about 120 pounds. She had previously weighed about 160. The findings which they presented to me seemed to be quite consistent with their diagnosis of primary splenic leukemia and I proceeded to operate with that diagnosis.

My assistant, Dr. Gatewood, who was with me in the operation, on examining the patient said it seemed to him more like an enlarged kidney than a spleen. The medical consultants, however, ruled this out because of the relationship of the colon to the tumor, the tumor apparently overriding the distended colon. I made, therefore, the usual S-shaped incision on the left side which I have employed for some time in my splenectomies, made a very wide exposure of the peritoneal cavity, and came down to a huge tumor which was retroperitoneal. The spleen was quite normal. I recognized at once that I had a very large solid tumor of the left kidney to deal with. I therefore divided the outer layer of mesocolon of the descending colon and the splenic flexure, pushed the colon to the inner side, and removed a huge hypernephroma of the left kidney.

I want simply to cite this case as an example of the difficulties which we have to encounter in abdominal diagnosis and to remind you of the fact that in hypernephroma we find blood in the urine in only about half the cases, even where the tumor is very large, and there may be no evidence from the urine examination of the kidney involvement.

We shall now proceed to operate upon a patient who has been very carefully gone over by my associate, Dr. Robert H. Herbst. This patient, a young man of twenty-five, came to my service about a week ago and Dr. Herbst has made a very careful analysis of the case and I am able to present to you an excellent example of the way that a kidney stone case should be studied.

Clinically he presented a history of repeated kidney colics on the right side. He had never had one on the left side. Examination of the urine showed some red blood-corpuscles and some leukocytes. The *x*-ray picture showed, as you see in the window, a large number of stones in the pelvis—in the upper and lower pelvis—and in the calices of the right kidney (Fig. 395). Ureteral catheters were passed in both kidneys. The thalein test showed the left kidney secreting a normal amount of urine. The thalein test of the right kidney showed it doing much less than its normal work. The blood chemistry examination was normal (see charts, Fig. 396). The general physical examina-

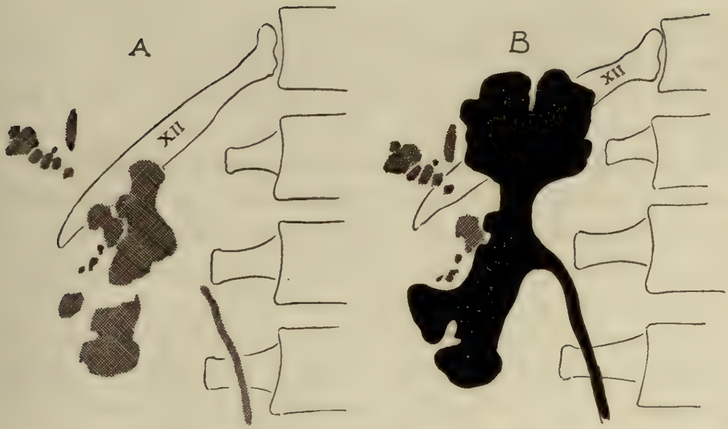
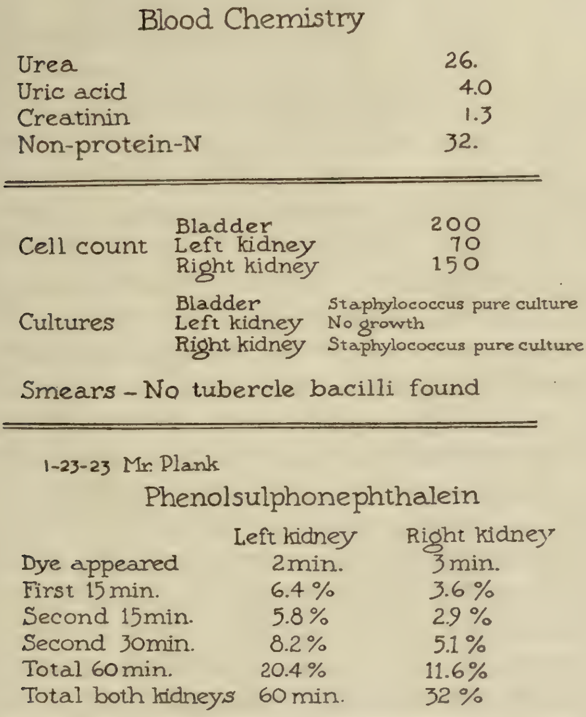


Fig. 395.—*A*, *x*-Ray of kidney stones. *B*, *x*-Ray showing kidney filled with contrast fluid.



Blood Chemistry

Urea	26.
Uric acid	4.0
Creatinin	1.3
Non-protein-N	32.

Cell count	Bladder	200
	Left kidney	70
	Right kidney	150
Cultures	Bladder	Staphylococcus pure culture
	Left kidney	No growth
	Right kidney	Staphylococcus pure culture

Smears – No tubercle bacilli found

1-23-23 Mr. Plank

Phenolsulphonephthalein

	Left kidney	Right kidney
Dye appeared	2 min.	3 min.
First 15 min.	6.4 %	3.6 %
Second 15 min.	5.8 %	2.9 %
Second 30 min.	8.2 %	5.1 %
Total 60 min.	20.4 %	11.6 %
Total both kidneys	60 min.	32 %

Fig. 396.—Chart showing results of kidney tests.

tion of the patient showed him to be in excellent general condition with no contraindications to the operation.

We have, therefore, a definite diagnosis of stones in the right kidney. These stones involve the kidney so extensively that it would be impossible to remove them by pyelotomy. We have the knowledge that the patient has a normal competent left kidney and we are, therefore, in position, if at the exploratory the evidence warrants our doing so, to proceed at once to a nephrectomy.

I employ in these kidney cases 3 assistants, as I like to have my usual 2 assistants and third assistant, who flexes the leg of the operated side to a right angle with the thigh and the thigh to a right angle with the abdomen, so as to control the position of the patient on the table. The table upon which the patient is lying is so made that we can elevate the center of the table and increase in that way the distance between the crest of the ilium and the last rib. Dr. Herb is giving him gas and ether, as there is no contraindication to its employment and it is the most satisfactory anesthetic that we can employ under normal conditions. I am making now a long incision beginning a fingerbreadth above the crest of the ilium and passing upward and backward to the costovertebral angle. I divide in this incision the skin, superficial fascia, and the latissimus dorsi muscle. I then extend the incision deeper, dividing the anterior edge of the external oblique and the lumbar fascia, and come to the quadriceps lumborum muscle. In doing this I divide a good-sized branch of the lumbar artery, which spurts and requires clamping and ligation. I am fortunate, however, in not injuring the twelfth intercostal nerve. I now open through the anterior layer of the lumbar fascia into the perinephritic space and come down to the fatty capsule of the kidney. I now introduce my hands into the incision, grasping with the left hand the twelfth rib and in the right the crest of the ilium, and I very gradually stretch the incision until I feel something give way in the twelfth rib. I have either fractured the twelfth rib or else I have torn the ligaments binding the head and neck of the twelfth dorsal vertebra so as to permit my pulling the twelfth rib up an inch higher than I otherwise could. This maneuver increases very materially the extent of my exposure, and I have found by experience that it is very much better to do this than it is to resect the twelfth rib, which is entirely unnecessary. One can obtain quite as much room by this stretching method with a fractured rib if necessary as one can obtain by resection of the twelfth rib. I now very carefully separate the fatty capsule from the fibrous capsule through the entire extent of the kidney and bring the kidney out through the external wound. As I do this I can feel on the surface of the kidney the stones that it contains. The wall for an extent of about 2 inches square is very thin, so that I can feel these stones like beans in a bean bag. It is evident from the gross appearance and from the conditions that we find that it would be impossible for us to remove all these stones with any degree of certainty, and that if we did these pockets in this damaged kidney would certainly furnish conditions which would produce a recurrence of the stones and make a secondary nephrectomy necessary in order to secure a cure. On that account I decide at once to do a nephrectomy. I shall not separate the ureter from the vessels, but simply put a large full-curved clamp (Fig. 397), the same as the clamps which I use in my cholecystectomy work, on the pedicle of the kidney. The pedicle here will consist of the ureter and the vessels. There is no objection to this because there is no evidence of tuberculosis or malignant disease in this case. I cut off the kidney distal to the clamp, ligate this rather large pedicle with a strong piece of iodized catgut and then remove the clamp. I now make a second ligation of the pedicle; grasping the pedicle a second time with another strong piece of catgut I make this second ligation for additional protection against hemorrhage. I shall drain this case as I always do with a split rubber tube containing a wick of iodoform gauze. I now close the wound. The method of closure is, I think, interesting and is one that you can quite advantageously adopt. I shall close with 3 large button tension sutures, the same button tension sutures that we use so frequently in our abdominal work. We have found them to be of special value in these kidney cases. They secure perfect apposition. They splint the wound and put it absolutely at rest. They furnish the very strongest assurance against postoperative hernia, because if necessary we leave them in position for fifteen or twenty days and they place the wound in such a secure position that we do not hesitate to allow our patients to sit up in bed or even in a chair within a few days after operation if condition warrants. The muscle layers of the incision we bring together accurately with buried catgut, using a moderate-sized gut, as the catgut here simply answers the purpose of approximation, the tension being taken by the button sutures.

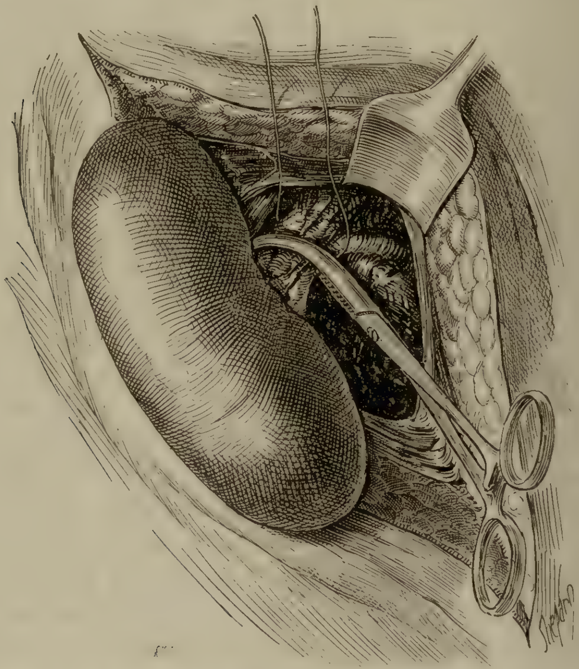


Fig. 397.—Use of curved cholecystectomy clamp and ligation of kidney pedicle.

Now let us examine the specimen which we have removed. On splitting open the kidney (Fig. 398), as we do by an ordinary postmortem cut throughout its entire extent, you see that the pelvis and calices are filled with stones and there is this interesting fact that two of these stones are embedded and fixed so that we cannot take them out. They seem to be attached to some of the papillæ, which have the appearance of growing into the stone. This reminds me of an interesting case which I did a few months ago which was very carefully worked up by my associate, Dr. D. B. Phemister. I shall show you this specimen.

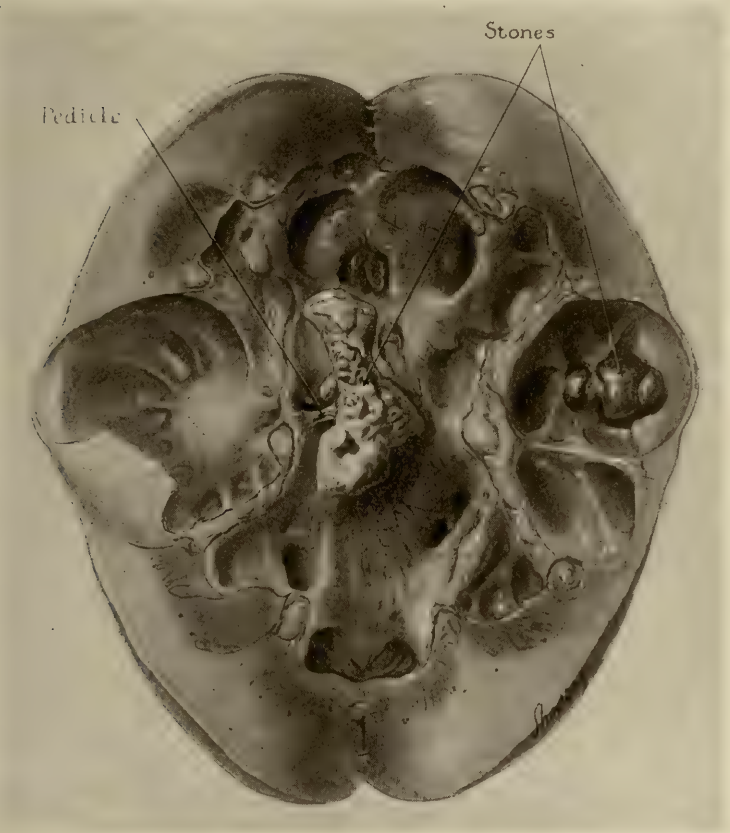


Fig. 398.—Specimen of kidney. Central stone has been displaced to right somewhat in order that attachment may be shown.

Dr. Phemister found on examining the kidney carefully that there was a large U-shaped stone which was fixed very tightly to the structures of the kidney, and on careful examination he found that one of the papillæ of the kidney had grown into the stone and from this papilla a new growth of true bone had grown into the stone for a considerable distance. I have asked Dr. Phemister to make a full report of that case and shall ask him to include this case which we have just operated upon in that same report. It will be interesting to analyze carefully these cases in which the stones are fixed to the kidney tissue and to see the method by which such fixation is brought about.

CLINIC OF DRS. E. WYLLYS AND EDMUND ANDREWS

Mercy Hospital

HOUR-GLASS STOMACH

Patient Presenting a Peculiar History of Gastric Distress. Operation by Another Surgeon Failed to Corroborate the *x*-Ray Diagnosis of Hour-glass Stomach. Recurrence of Symptoms Led to Exploratory Operation. Hour-glass Condition Found to Be Very Marked. Technic of Operation.

The following case is one of Dr. Sippy's and has a rather peculiar history. For several years there has been considerable gastric distress and vomiting. The pain has been of a rather irregular character and has not the usual time relations, and is not always relieved by food or alkalies. Vomiting has been a constant feature. It occurs at unexpected times and is not always accompanied by pain. The patient first underwent an appendectomy for the relief of these symptoms. They were, however, not in the least influenced by the operation. I do not know who this first operator was. Later, however, she was under the care of a surgeon of wide experience, in whose judgment I have every confidence. In his hands the case was carefully studied and finally, on the basis of repeated *x*-ray examinations, the diagnosis of hour-glass stomach was made. He then operated and was very much surprised to find that there was no evidence of constriction about the stomach. I do not know just what pathology was encountered, but a posterior gastro-enterostomy was made. This operation also failed to be of benefit.

The case has now been under Dr. Sippy's observation for several weeks. Radiologic examinations made at numerous times under different conditions have never failed to show the deep incisura on the greater curvature about midway between the pylorus and cardia. These were not affected by the administration of atropin in large doses, and therefore do not appear to be contraction waves. They are said by the patient to resemble very closely the plates made before the other operation. As you can see, the stoma is still functioning and the pylorus is open. The duodenum appears normal. There is, however, a slight delay in the emptying of the stomach, especially of the proximal pouch. The other examinations have revealed an exceedingly variable acidity, both in the aspirations and the vomitus. Blood in the stools has been constant, leading to the assumption that active ulceration is present. Wassermann is negative.

I am now going to undertake the operation which is in a sense exploratory. The fact that the former surgeon did not find the hour-glass condition, even though he looked for it, is rather disconcerting. The persistent gastric hemorrhage which has resisted medical treatment and the resulting anemia are, however, ample justification for surgery. I am making a high midline incision, excising the old scar. Here I have the abdomen wide open and note no adhesions from the former operation. The stomach is lifted out and carefully inspected. Its contour is regular and no constriction can be found. Neither can I feel one. I have now palpated the entire stomach and no masses or craters of ulcers can be found. The pylorus is patent and admits the finger tips. I will now raise the transverse colon and omentum and inspect the stoma. This region is also remarkably free from adhesions. Here is the ligament of Treitz and the origin of the jejunum. The loop is short and the stoma quite properly placed. I can find nothing to criticize in the work done here. Neither can I find any evidence of secondary ulceration in the bowel. I had rather expected that this might be the cause of our trouble. Jejunal ulcers have of late been proved, too, much more common than we formerly believed. They are probably the commonest cause of recurrence of pain after gastro-enterostomy.

Now, just because I can neither see nor feel anything wrong with this stomach is not much evidence that it is normal. Intragastric exploration is the only sure way to rule out ulcer. It is only the indurated ulcers that we can palpate. I do not fear to lay the stomach widely open. It is a procedure which I have carried out repeatedly and I know that it is well tolerated. The gastric juice is sterile or nearly so and can be spilled almost with impunity. The wound is easy to close and as we can invert the edges all we want with no fear of obstructing the lumen it is very safe.

Dr. Sippy still sticks to his diagnosis of hour-glass stomach. He says that many times the constriction involves only the mucosa and cannot be felt or seen from the outside.

I am now making an incision in the stomach parallel to and a few centimeters away from the lesser curvature. It bleeds furiously and many clamps must be applied to control it. This is one of the drawbacks, but I do not believe it a vital one. We are now getting the hemorrhage under control. I might have divided the wall between clamps after the first little nick, but it does not seem right to devitalize the tissues so.

I see now that Dr. Sippy was right. There is an hour-glass condition and a very marked one. It involves the mucosa only. The hole between the two pouches is about large enough to admit one finger easily. The walls are smooth and no ulcers can be seen. There is no scarring or puckering about the fold of mucosa. It is soft and contains no scar tissue. Here, besides my incision, I find a tiny erosion. I would say that it was a tear made by myself except for one fact. It lies exactly under a point to which a tiny wisp of omentum was adherent. By slightly curving the incision back upon itself I have excised this ulcer, if it is one. There are several other bleeding points, but I am sure that all are artefacts. The gastric mucosa is exquisitely delicate and tears and bleeds with the slightest handling. Dr. Edmund is now pushing his finger up through the stoma from behind, thus inverting as much of the jejunum as possible into the field. The suture line is clearly visible, but appears normal and no ulcers can be found. He is now putting his finger from the stomach into the bowel and then with the other hand palpates further for ulcers. None can be demonstrated.

The problem now is what to do. I think I have discovered and removed the bleeding point. Both the pylorus and the stoma are patent. To divide the constricting band in the stomach would be difficult, as there would be none of the other layers to back up the suture line and considerable hemorrhage would occur between the layers of the stomach wall. However, I note that my incision opens both pouches. I am going to close it in the opposite direction from which it was made. That is, I made this cut longitudinally and am going to close it transversely. It is exactly like a Heineke-Mikulicz operation on the pylorus. I think that by this means we will establish ample communication between the two pouches and it will be done

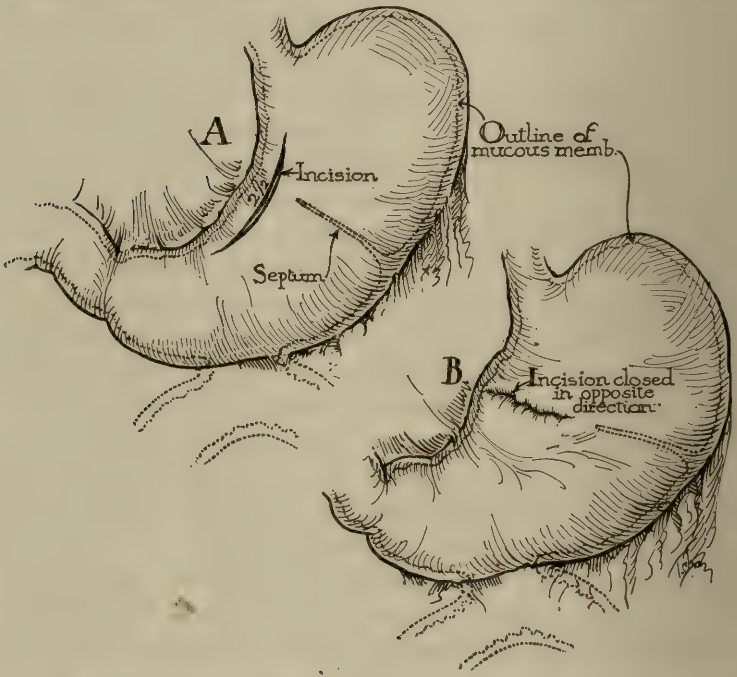


Fig. 399.—Drawing showing technic of operation for cure of hour-glass stomach.

without another step and much more safely than by a gastrogastrostomy. Dr. Edmund has now seized the middle of each side of the incision in Allis' forceps and by gently drawing them upward and apart, the cut is rendered a transverse one. He now rapidly runs a whip stitch along the mucosa. This controls most of the bleeding. The muscular and fibrous coats are now closed with a continuous suture. The whole is now inverted with a Lembert stitch. As there is no fear of stricture the inversion is made deeper than usual and for that reason the stitching is more secure and safer. I will close the abdomen in the usual manner.

Dr. Edmund suggests that such a structure as this would seem to have a congenital origin. The lack of any scar tissue in the neighborhood and the fact that the outer walls were not a part of the stricture tend, he says, to support this view. He suggests the possible parallel with the multilocular stomach of ruminants, and the midgastric sphincter which has recently been described by certain physiologists. It seems to me that there may be some such significance to these cases. The ileocecal valve is mainly a fold of mucosa, as are the valves in the rectum.

ENDOTHELIOMA OF THE BRAIN AND MENINGES. WIDE REMOVAL BY BLOCK DISSECTION

Patient Presenting Tumor of the Brain Resembling Pott's "Puffy Tumor" of the Scalp. Operation Revealed Basal-cell Endothelioma of Dural Origin. Technic of Removal by Block Dissection.

My purpose in showing this case and specimen is to illustrate the principle of block dissection and wide removal in brain surgery and to urge its superiority over mere enucleation. This is no more than an axiom in all malignant growths, but a radical operation on a tumor within the skull is seldom as easy as in other organs, which probably explains often the unsatisfactory results following their removal. In some degree this is inevitable and to some extent it is capable of improvement.

The end-result of a fairly large series of brain tumors removed by me in the past ten years has shown an unpleasant proportion of failures. Although the operative deaths have been few the permanent cures have also been few. Both in my own and my colleagues' cases there have been a bad and large percentage of recurrences and of postoperative epilepsy.

I am trying of late to do more radical operations, removing a zone of adjacent tissue, which I can best illustrate by showing the tumors themselves as they appeared after removal. That this is always going to be possible as it is in breast carcinoma I do not contend, but it may be a direction toward which we may look in brain surgery of the future.

This is only one of the factors in future improvement. The other factors are earlier diagnosis and more accurate localization.

Progress in these directions is sure to go on as our experience and pathologic knowledge enlarges. When I recall in my own and other clinics the many cases of brain tumor cut down upon, only to find them impossible of removal from extensive adhesions, early metastasis, or incurable paralysis already established, it is difficult to avoid pessimism toward the reported work of the best specialists. If we grow optimistic as a result of a few successful cases our optimism is apt to receive a severe shock when we see the cold statistical tables of end-results.

If any brighter future is ahead it will be found in a combination of more radical block removal of segments of brain tissue which, in turn, can only be possible when earlier diagnosis has been achieved by the researches of the pathologist and the neurologist and, through them, the general practitioners.

It is the same story repeated of the appendix or the perforating ulcer, only the problem is more difficult because early diagnosis is often impossible.

The case before us, which was one of large brain tumor of the occipital region, was invading the cortex, dura, and bone, and scalp block dissection meant removal of the tumor itself with a layer of normal brain, both tables of the skull and the overlying pericranium, and occipitofrontalis and scalp. The principles involved were exactly those of, say, a breast amputation where we excise with the growth the adjacent muscle skin and fascia in a block dissection. This is a difficult thing in the brain and yet this was for once relatively easy, instead of being as in so many cases impossible of execution; the only obstacle was a matter of dealing with large vessels of the deep sulci which, however, lent themselves fairly well to ligation, being in the apex of an open wound formed by removal of a convolution. In a former paper I described certain angiomas which I was able to remove only by destroying with the hot iron, and then only in two stages and at some risk of destroying too much or too little. Here the work was relatively safe and easy, the meningeal vessels being easily controlled and those of the arachnopia almost as easily, while Horsley's wax was a good hemostatic in the diploë.

The patient, a man of sixty-four, came to our clinic from Philadelphia, where, however, a diagnosis had not been made. A persistent one-sided occipital headache was his most important symptom. I found no retinal changes, and this was confirmed by a competent ophthalmologist; neither were there any focal symptoms. A radiogram showed no tumor shadow, but a slight thinning or atrophy of a disk of bone over the occipital lobes about 4 to 5 cm. in diameter with a corresponding bulge or thickening of the scalp or pericranium. This resembled the condition formerly called "Pott's puffy tumor" of the scalp, but was in my opinion indicative of malignancy rather than osteomyelitis.

I therefore advised radical operation and planned the work so as to include wide extirpation, namely, of the bone and scalp, the tumor itself within, and a layer of brain tissue enclosing it. To execute this a horseshoe flap was raised and the overlying occipitofrontalis excised with the bone-flap 5 by 6 cm. in size. As was anticipated, the tumor was continuous from within through both tables of the skull, pericranium, and muscle, and, in fact, approached the hairy scalp, so that a circular piece of it was also lost. Internally the growth was spheric, lying within the occipital lobe, was about 4 cm., in a globular form, and of firm consistence.

No great difficulty attended its removal, except that especial care was taken to remove a shell of brain tissue $\frac{1}{2}$ cm. enclosing it, and also a circle of normal dura and normal bone around it, all of which you see in the specimen and photograph.

This involved tying certain vessels of the pia and dura which were not hard to find in the large wound. No effort was made to close the dura or skull defect, which might have been done by bone and fascial transplants, as we preferred to postpone this plastic work until after a course of radiotherapy.

The tumor which I show here is an exceedingly good example of the basal-cell endothelioma of the dural origin so well described by Mallory, Cushing, and, I think, Frazier, and others.

While I have done no original work on it and realize that some of the more recent study on this special tumor may have escaped my attention, I think we are agreed that endotheliomata are best classified by comparing normal tissue, for example, fibromata to fibroblasts, gliomata to glioblasts. The so-called dural endotheliomata are not always so classified, but on the basis of their location. As you well see in these slides they are characterized by whorls and by pallisade arrangement of the nuclei. If I am not up to date in this I hope my neurologic colleagues will correct me, but this classifying by location may lead us away from the obvious fact that these tumors are like certain growths we find in peripheral nerves called multiple neuromata, or Recklinghausen's disease. These growths spring from the inner surface of dura or outer surface of arachnoid. The tumors are spheric and crowd aside or displace brain tissue before they invade it. Dr. Ochsner published a case last year with photographs showing this feature clearly.

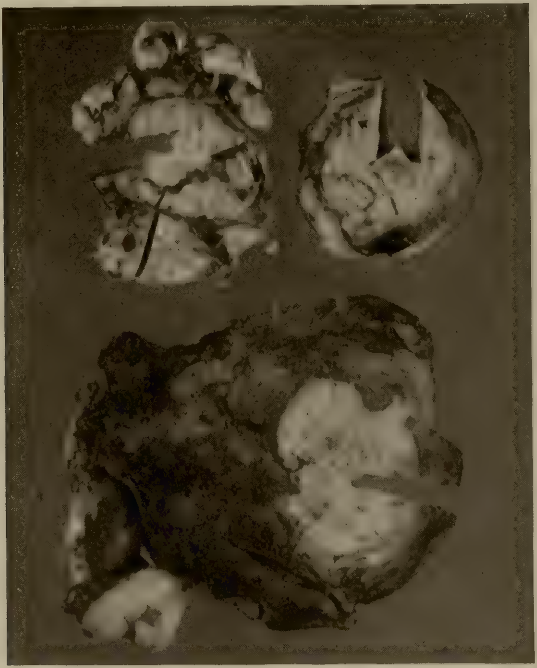


Fig. 400.—Figure in upper left-hand corner represents section from gross specimen. Tumor surrounded by normal brain; portions of two convolutions and vessels of one sulcus. Figure in upper right-hand corner shows section of tumor removed with block of normal brain. Lower figure represents block of skull, pericranium, muscle, and hairy scalp surrounding tumor.

The cells that you see in the high power are large, flat, or spindle and often concentric around blood-vessels, while the pallisaded arrangement of the nuclei in parallel columns is typical. Cells in mytosis are easily found in every field.

Collogen is abundant in the stroma and the stroma in the dura show numerous invasions. We also see mitotic figures, arachnoid villi, and pacchionian bodies.

Comment.—Brain tumor operations are an exception to usual rule in surgery of malignancy, in that we do not attempt *block dissection.*

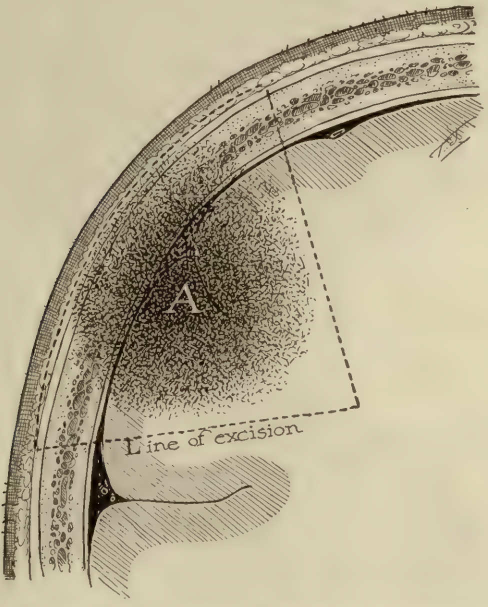


Fig. 401.—Drawing showing outline of flap and section removed at operation. A, Tumor mass.

No distinction has been made between *radical* and *palliative* because any kind of removal was a triumph of modern surgery. *Enucleation* was the rule, leaving a capsule bed. In any other part of the body this would be called a *palliative* operation.

Safety and conservatism demand a compromise. No more brilliant chapter has been written in modern science than the epic on brain and cord surgery, yet we may see vistas of further advance when we have widened the field to include some old surgical principles now excluded.

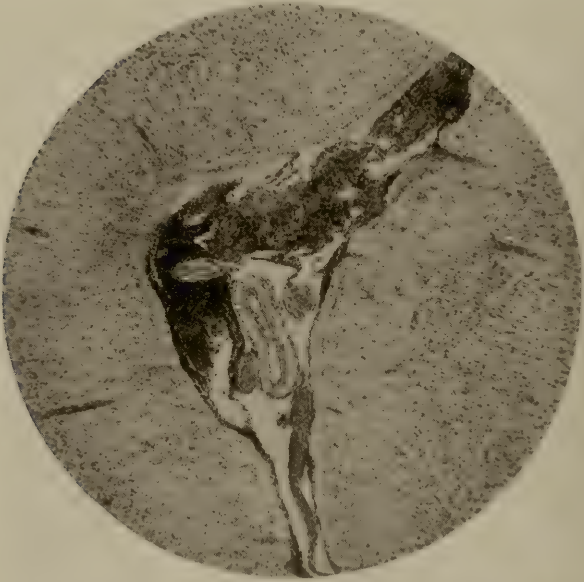


Fig. 402.—Microphotograph of section of tumor. Magnification 60 diameters.

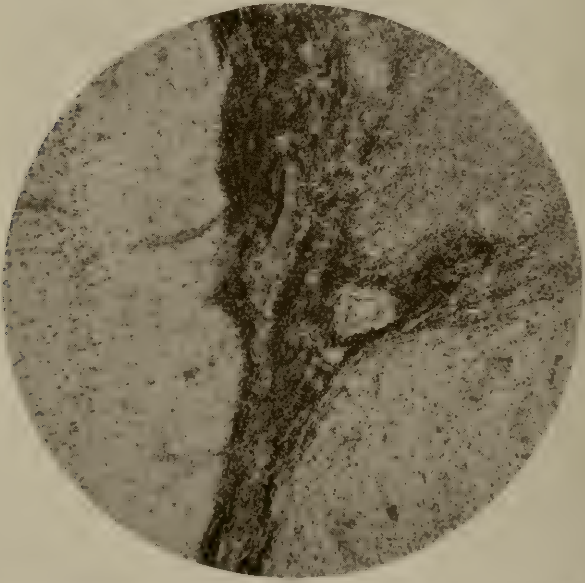


Fig. 403.—Microphotograph of section of tumor. Magnification 80 diameters.

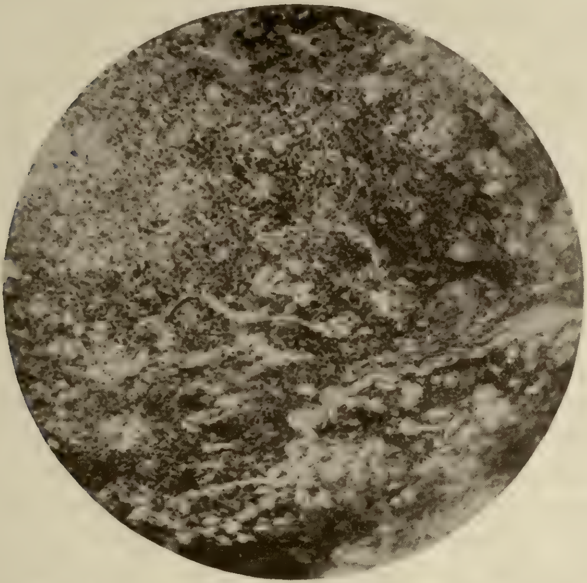


Fig. 404.—Microphotograph of section of tumor. Magnification 130 diameters.

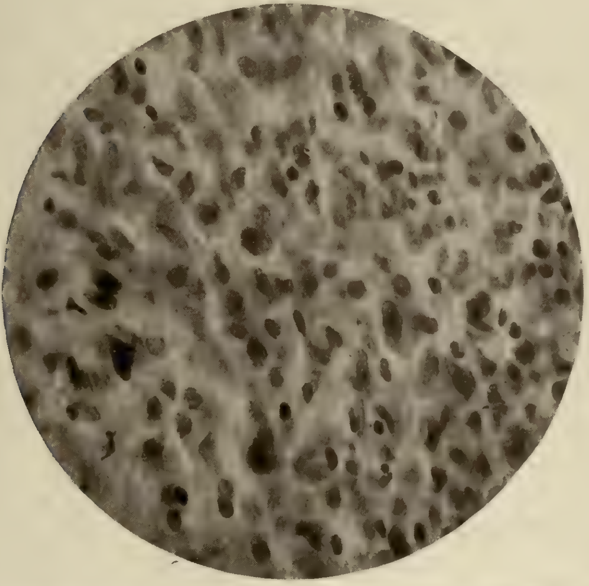


Fig. 405.—Microphotograph of section of tumor. Magnification 560 diameters.

One of these is the principle of block or massive removal of tumors. Perhaps this can never be done. Possibly in the cord and certain deep tracts of the brain the prospect is hopeless, but other parts do offer the chance.

I have been able to do this more commonly and even more radically than I at first hoped. Now I know that this work must be a progressive development. We enlarge little by little the work as it proves its success slowly in the best clinics of the world.

New roads can only be built as branches of old ones. Horsley long ago showed us that whole convolutions could be excised at the cortex, I can and do take one or two, and with a glioma, instead of enucleating it. The vessels in pia or dura, the membranes themselves, the falx or tentorium, the dura bone, pericranium, or scalp can be included in block removal, as you see in one of these specimens. On the whole, experience confirms my faith in the value of this idea. I have no desire to criticize the older methods. I have nothing but admiration for the splendid evolution of brain tumor surgery. This brilliant scientific leadership is all that has made our later work possible. Many of the difficulties are inherent, but I think those specimens prove that block dissection and mass removal is sometimes possible.

As I work toward this goal it proves less difficult than I feared. Progress will depend, as Frazier so well says, upon early diagnosis and localization more than upon new methods of operation. The earlier and smaller a neoplasm is found, the more it lends itself to an excision. I believe this will be the future method of clinics.

CLINIC OF DR. DAVID C. STRAUS

Cook County Hospital

SUBPHRENIC ABSCESS. TRANSPLEURAL DRAINAGE UNDER PARAVERTEBRAL ANESTHESIA

A MAN seventy-two years of age entered the hospital because of pain and tenderness in the right hypochondrium that came on relatively suddenly two days before admission, accompanied by a visible and palpable tumor in that region. He had been operated upon three months previously for ruptured appendix; wound drained up to six weeks before admission. Examination disclosed a right subphrenic abscess. It was believed the painful mass that suddenly appeared beneath the right costal margin was due to pointing of the subphrenic abscess. Incision under general ether anesthesia. Subsequent course and Roentgen examination showed that this was a separate abscess, limited to the abdominal wall, and not connected with the subphrenic collection. Four days later the subphrenic abscess was drained under paravertebral anesthesia by subperiosteal resection of 10 cm. of the ninth and tenth ribs in the posterior axillary line, *i. e.*, transpleurally. Recovery. Technic of paravertebral anesthesia in operations on the diaphragm and liver.

W. P., Cook County Hospital, No. 789,459, male, seventy-two years of age, was admitted to my service February 25, 1922. He complained of pain and tenderness in the right hypochondrium and a palpable swelling just below the right costal arch, and stated that these symptoms had come on relatively suddenly two days previously.

In November, 1921 he had been operated upon for a ruptured appendix, the wound had drained for some time, then healed, but later the wound reopened, discharging pus. This grad-

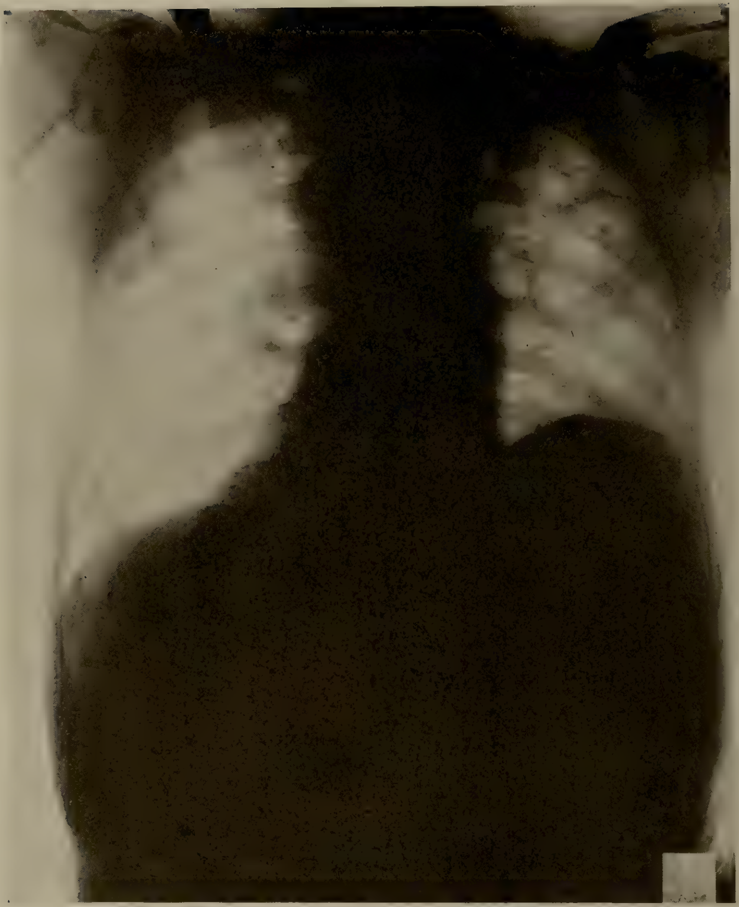


Fig. 406.—Roentgenogram showing right subphrenic abscess secondary to a ruptured appendix, operated upon three months before admission. This shows that the right side of the diaphragm is unusually high, reaching the seventh rib. The cupola is more angular than normal, especially in its lateral portion, the most striking feature is the almost vertical direction of the outer extremity of the diaphragm, so that the costodiaphragmatic angle is about 90 degrees. This is typical of a subphrenic abscess. Fluoroscopic examination showed that this half of the diaphragm was immobile. (Position of picture reversed in printing.)

ually subsided, and the wound again healed up about six weeks before he came to the hospital, but since then he had occasional "sore spots in the right side." Two days before entering the hospital he began to have pain, tenderness, and a swelling in the right upper quadrant of the abdomen just below the costal margin. He had had no chills, and, so far as he was aware, no fever. He stated that his appetite was good, bowels were regular, and that he slept well. Previous history was otherwise negative, except that he had lost a great deal of weight since November.

Physical Examination.—The patient, a poorly nourished white male, looked his age, and did not appear acutely ill, but seemed weak. His color was slightly yellowish. Examination of the head and neck showed nothing of interest. Examination of the chest showed nothing of interest except for an abnormal dulness in the right lower chest posteriorly, a continuation upward of the area of liver dulness, corresponding to the upper border of the shadow seen in the roentgenogram (Fig. 406).

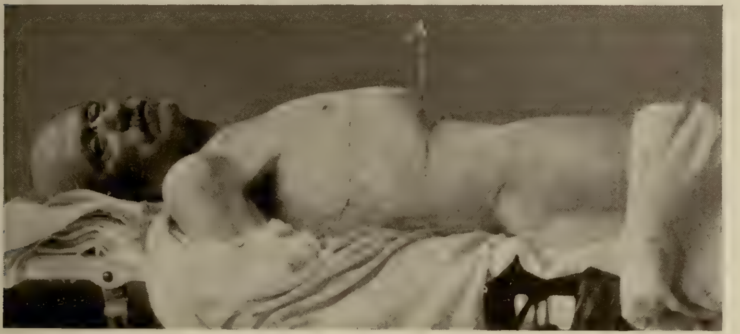


Fig. 407.—Photograph of patient immediately before operation. This shows that the abdomen is flat, except in the right upper quadrant immediately below the costal margin, where there was a large, smooth, circumscribed, hard, very tender swelling. *A* shows the location of this abscess. The lines on the photograph show the upper and lower margins of liver dulness.

The essential pathologic findings were in the abdomen. The abdomen was soft, flat, and skin lax everywhere except in the right upper quadrant just beneath the costal margin. Here there was a large, smooth, circumscribed, hard, very tender swelling (Fig. 407). The skin over it was not discolored, and there was no fluctuation. There was a large incisional hernia in the old right rectus appendectomy incision, but no tenderness or evidence of existing infection in adjoining portion of the abdominal wall or the immediate neighborhood.

The demonstrable pathology was limited to the right upper quadrant of the abdomen. The afternoon temperature was 99° F., pulse 96, and of fair quality, and respirations 24. He seemed very weak. A blood examination showed: Leukocyte count, 16,200; hemoglobin, 80 per cent.; erythrocytes, 4,800,000. The differential count showed polymorphonuclear neutrophils, 80 per cent.; small mononuclears, 15 per cent.; large mononuclears, 4 per cent., and eosinophils, 1 per cent. Urinalysis showed color amber, specific gravity 1026, reaction acid, no albumin, no sugar, microscopic examination negative.

A diagnosis was made of right subphrenic abscess, secondary to the old ruptured appendix, and from the history and the physical findings it was believed that the sudden swelling, pain, and tenderness beneath the right costal margin was due to pointing of the subphrenic collection at this point.

To confirm the diagnosis of right subphrenic abscess the patient was ordered to the roentgenologic department for fluoroscopic and plate examination. The report reads: "The right diaphragm is unusually high, higher in outer extremity. The costodiaphragmatic angle of this side is about 90 degrees. Fluoroscopic examination shows very little mobility of same. This accords with the clinical diagnosis of subphrenic abscess." The roentgenogram (Fig. 406) is typical of subphrenic abscess, the striking finding on the plate being the unusual height of the diaphragm and the steep rise, in addition to the abnormal height at the costodiaphragmatic angle. This, together with the fact that this portion of the diaphragm is essentially immobile, is typical of subphrenic abscess. In liver abscess while the height and contour may be similar, the costodiaphragmatic angle is ordinarily not so steep, and, what is even more important, the diaphragm often is not immobile. As the differential diagnosis, etiology, and treatment of subphrenic abscess was discussed in detail in a former clinic,[1] these will not be gone into further at this time.

Having confirmed the diagnosis of subphrenic abscess, operation was arranged for.

Operation.—The patient was operated under general ether anesthesia February 28, 1922. Although I ordinarily prefer to attack a right subphrenic abscess by the transpleural route through an incision in the right posterior axillary line as described in a recent clinic,[2] it may be indicated to approach the abscess by some other route or incision in a particular case, depending on the findings, as was discussed in that clinic. In this case, as the prominent tender swelling presenting immediately beneath the right costal margin anteriorly led me to believe that the subphrenic collection was pointing here, I decided to make my initial incision over this mass, and continue the operation as the findings indicated. It is unusual to approach a subphrenic abscess by the anterior route, and a lateral or posterior route is, in general, preferable. But if the abscess is pointing anteriorly, and causes a bulging which threatens to perforate anteriorly, this presents an indication to go in anteriorly.

With the patient lying on his back, in the ordinary dorsal position, I made a small incision through the skin parallel to the costal margin and over the long axis of the center of the swelling just below the costal margin (Fig. 407). The anterior sheath of the right rectus muscle was next incised. The fibers of the right rectus muscle were then separated, and when this was done the abscess was opened and thick pus escaped. Introducing the right index-finger, it was impossible to determine whether or not there was any communication between this pus collection and the subphrenic abscess. Realizing that it might or might not be in communication with the subphrenic collection, I deemed it unwise to do more than insert a drain and await results. If there were a free communication, even though not large, I thought ample drainage might result. On the other hand, if this by any chance were a separate abscess, I did not care to take the great risk of infecting the general peritoneal cavity by entering the abdomen through this infected field. Consequently, I inserted a large iodoform gauze drain into this cavity, to hold the walls apart, and completed the operation by merely applying a dry dressing.

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[1] Straus, David C.: Subdiaphragmatic Abscess: Transpleural Drainage of a Case Due to Abscess of Liver, Surgical Clinics of Chicago, 4, 377, April, 1920.

[2] Ibid.

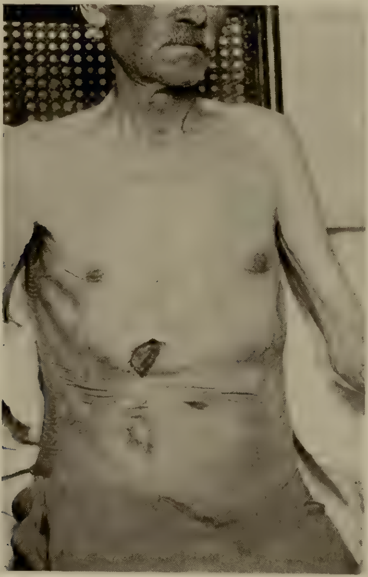

Fig. 408.—Photograph of patient taken after he was up in the wheel chair. This shows the old healed scar of the incision made to drain the suppurative appendix which was the cause of the subphrenic abscess. This operation was performed three months before admission to the hospital. It also shows the incision made at the first operation and kept open to drain the independent abscess of the anterior abdominal wall.

Although the entire procedure took but twenty minutes, he stood the interference poorly, and his condition was not good. His pulse and respiration had risen from 86 and 24 to 158 and 40, the pulse being weak, and the respirations abdominal. Under ordinary shock treatment his condition improved, and by 2

P. M. the pulse was 88 and respirations 24 again. His temperature that evening was 98.6° F., the following day (March 1st) did not rise above 99° F., on the 2d reached 99.4° F. as the highest, and on the 3d only once was recorded as over 100° F. The pulse remained between 80 and 100, usually being about 90, and respirations between 20 and 30, usually about 24. Physical examination of the chest showed no change in the area of abnormal dulness, and there was but little discharge from the drainage opening. It seemed perfectly clear now that the abscess we had drained did not communicate with the subphrenic abscess. To corroborate our findings the patient was sent to the roentgenologic department for another roentgenogram on March 3d. The plate showed no change had occurred since the operation (Fig. 406). Similarly, the leukocyte count had not decreased. On February 27th, the day before the operation, it was 16,600; on March 1st, the day following the operation, it fell but slightly, 15,800, but on March 3d, the day the roentgenogram was taken, it had risen to 17,800, or the highest it had been. As it was obvious that the subphrenic abscess was still undrained, I decided to attack it the following morning.

Second Operation: Transpleural Drainage of Right Subphrenic Abscess (March 4, 1922) Under Paravertebral Anesthesia.—Considering the fact that the patient had had a general ether anesthesia only four days before, it seemed unwise to give him a general anesthetic again so soon. Furthermore, he had taken the anesthetic badly. For this reason I decided to employ paravertebral anesthesia. I carried out in a general way the technic as outlined by Pauchet, Sourdat, and Labat,[1] as later slightly modified by Labat, which has subsequently been published.[2]

The patient having been given a hypodermic injection of morphin sulphate, gr. $\frac{1}{4}$, with atropin sulphate, gr. 1/150, half an hour before bringing him to the operating-room, was placed on the table so that he lay on his left side (the healthy side) with his back arched, thighs flexed, knees drawn upward in strong flexion, and head bent forward, so as to widen the intercostal and intervertebral spaces as much as possible, just as is done in making a lumbar puncture, and a sand-bag was placed under his loin in order to straighten the vertebral column in a sagittal plane (Fig. 409). The operative field was prepared in the ordinary manner.

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[1] Pauchet, Sourdat, and Labat: L'Anesthesie Regionale, Troisieme edition, Paris, Libraire Octave Doin, Gaston Doin, Editeure, 1921.

[2] Labat, Gaston: Regional Anesthesia, W. B. Saunders Co., Philadelphia and London, 1922.

In planning the details of paravertebral anesthesia for a particular operation one has to consider the nerve supply to the tissue and organs that are to be attacked. In operations on the diaphragm the terminal fibers of the phrenic nerve have to be blocked, for these supply both the superior and inferior surface of the diaphragm with sensory fibers. These can be blocked by infiltrating the diaphragm after it is exposed, or can be blocked paravertebrally by blocking its roots near their origin. The phrenic nerve arises essentially from the C_4, with anastomoses from the C_3 and C_5. The surest location to block it in the neck is above the transverse process of the fifth cervical vertebra. Only the peripheral portion of the diaphragm gets its sensory innervation from the intercostal nerves, and for this reason a mere blocking of the intercostal nerves suffices only to secure anesthesia of the periphery of the diaphragm.

In this patient I decided to block the diaphragm by direct injection after I had exposed it. As I planned to resect a portion of the ninth and tenth ribs, it was essential to block not only the ninth, tenth, eleventh, and twelfth dorsal nerves, but, in addition, the eighth dorsal and the first lumbar, for we know it is impossible to obtain complete anesthesia of any particular intercostal space unless the intercostal nerve immediately above it and the intercostal nerve immediately below it are also blocked, for the cutaneous branches of the adjacent nerves overlap the intercostal space supplied by that nerve.

The twelfth rib was palpated, and the spinous process of the twelfth dorsal vertebra located by Labat's method by dropping a line from the twelfth rib vertically to the line of the spinous processes, at a point on the twelfth rib where this vertical line measures 5 cm. to the line of the spinous processes (Fig. 409). The other spinous processes are counted from this one.

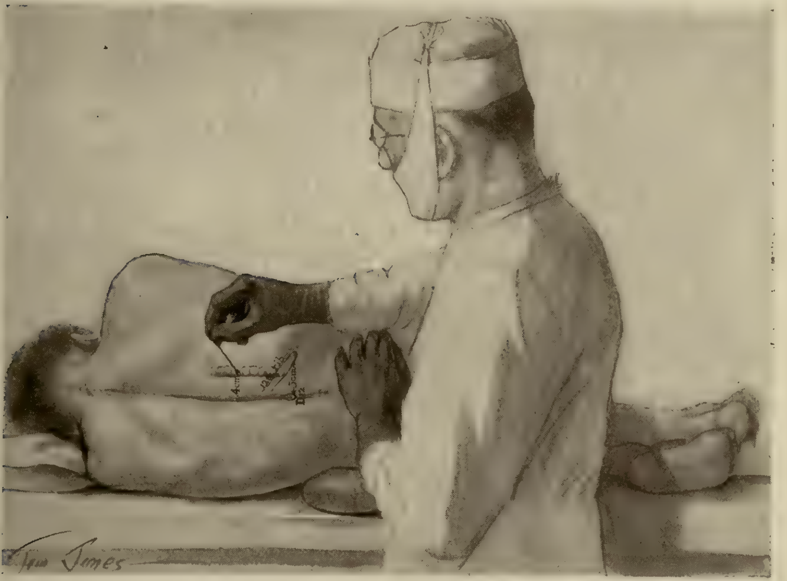

Fig. 409.—Drawing (modified after Pauchet, Sourdat, and Labat and after Labat). The patient lies on his healthy side with his back arched, thighs flexed, knees drawn upward in strong flexion, and head bent forward, so as to widen the intercostal and intervertebral spaces as much as possible, just as is done in making a lumbar puncture, and a sand-bag is placed under the loin in order to straighten the vertebral column in a sagittal plane. The twelfth rib is located by palpation. The spinous process of the twelfth dorsal vertebra is located by Labat's method by dropping a line from the twelfth rib vertically to the line of the spinous processes, at a point on the twelfth rib where this vertical line measures 5 cm. to the line of the spinous processes. The other spinous processes are counted from this one. The skin is injected intradermically along a line 4 cm. from and parallel to the line of the spinous processes. Each paravertebral injection is made at a distance of 4 cm. from the line of the spinous processes. The illustration shows the final direction of the needle which is inserted downward at an angle of 45 degrees and inward at an angle of 45 degrees. (Fig. 410 shows the deep relations of the needle in its course.)

The tips of the spinous processes of the first to sixth dorsal vertebræ lie approximately at the level of the intertransverse spaces, bounded by the two next lower vertebræ, that is, at the level of the next lower nerve. For example, the spinous process of the first to sixth dorsal vertebræ correspond to the second to seventh dorsal nerves. But as the lower dorsal spinous processes have a more oblique course, and are longer, the tips of these lower spinous processes lie opposite the lower portion of the corresponding intertransverse spaces. However, there are variations, and when the transverse processes are very long, the tip may even reach the next lower interspace. In every case, however, the field is tested after making the injections, and if the blocked area does not prove sufficiently wide for the intended operation, or if one of the nerves has not been reached by the anesthetic fluid, supplementary injections are made.

Next, using a centimeter ruler that had been boiled up with the instruments, a point 4 cm. from the sixth spinous process was marked on the right side of the spinous process, and similarly a point 4 cm. from the right of first lumbar vertebra, and a line drawn connecting these two points, and this line 4 cm. from and parallel to the line of the spinous processes was blocked *intradermically* by a series of overlapping wheals, using a long needle so as to limit the number of reinsertions as much as possible. The appearance of the line of infiltration if properly performed has the appearance of goose-flesh, or, as the French have called it, "peau d'orange" (orange skin). The essential point is that this injection should be made within the skin, and not subcutaneously.

Next, each of the nerves, eighth dorsal to first lumbar, inclusive, is injected in the following manner: A fine needle, 8 cm. long, and with a hub (the portion that fits the syringe) that fits either a Luer or Record 10 c.c. syringe, is grasped by its hub, and the shaft of the needle directed so that its point pierces the "peau d'orange," *i. e.*, 4 cm. from the median line, at the level of the rib immediately above spinous process of the sixth dorsal vertebra, *i. e.*, the eighth rib, and introducing the needle perpendicularly to the skin and so that it will impinge upon the superior border of the rib (Fig. 409). If the point of the needle does not strike the rib at this portion, or does not strike the rib at all, it is not necessary to withdraw the needle completely and pass it through another point of entrance, but merely to withdraw it until its point lies in the subcutaneous tissue, and then by displacing the skin upward or downward, the point of the needle is made to lie over the upper margin of the rib. When the point of the needle is felt to have come in contact with the rib, the needle is withdrawn slightly in order to change its direction.

Next, the hub of the needle is swung outward and upward, so that now the needle is pointing downward at an angle of 45 degrees and inward at an angle of 45 degrees (Fig. 410). The needle is now slowly inserted at this angle and its point again advanced until it strikes the lower border of the rib. When the needle point is felt to have progressed until it just passes beneath the lower border of the rib, taking care to maintain the same direction with the needle, it is advanced 2 cm. further, and here is stopped. In this position the point of the needle has passed downward, inward, and forward, obliquely across the intercostal space, and lies at a point equally distant from the two ribs, *i. e.*, in the midpoint of the intercostal space, and lies within the intercostal muscles, about 1 cm. anterior to the transverse process, and in relation to the point where the anterior primary division gives off the ramus communicans to the sympathetic system (Fig. 410).

There are several reasons why it is advisable and desirable to pass the needle before it is attached to the syringe. In the upper thoracic region occasionally cerebrospinal fluid comes out through the needle. Labat has explained this as probably being due to an abnormal prolongation of the subarachnoid culdesac accompanying the nerve beyond the intervertebral foramen. If cerebrospinal fluid does escape through the needle, the needle is slowly withdrawn until this no longer continues, as it is not desired to inject the anesthetic intraspinally. The chief reason for introducing the needle unattached to the syringe, however, is to give notice in case the needle punctures an intercostal blood-vessel. Should this occur, blood escapes from the needle. The needle should be withdrawn slowly until the flow of blood ceases, and then the direction of the needle is changed slightly. The small amount of blood that escapes into the tissues is of no importance. It is highly important, however, that the novocain solution be not injected directly into the

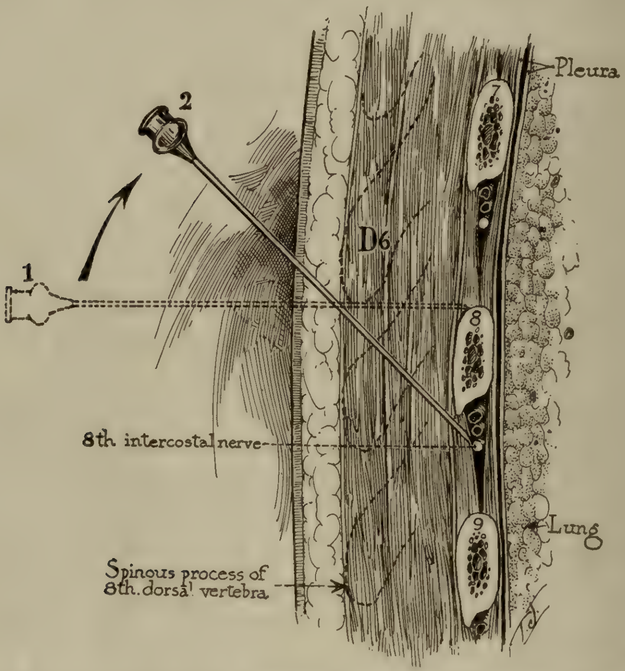

Fig. 410.—Drawing (after Pauchet, Sourdat, and Labat). Showing the technic of introducing the needle in carrying out paravertebral anesthesia in operating on subphrenic abscess. The needle is inserted perpendicularly to the skin at a point 4 cm. lateral to the spinous process of the sixth cervical vertebra, is advanced until its point impinges on the upper margin of the eighth rib, the needle is then withdrawn partially until its direction can be changed. Next the hub of the needle is swung outward and upward, so that now the needle is pointing downward at an angle of 45 degrees and inward at an angle of 45 degrees, so that the point of the needle when now advanced passes below the lower margin of the eighth rib. Maintaining this obliquity of 45 degrees it is inserted 2 cm. further, so that its point comes to lie in the middle of the intercostal space at a point about 1 cm. anterior to the transverse process and in the immediate vicinity of the eighth intercostal nerve at the point where the ramus communicans is given off to the sympathetic system.

blood-stream. If the needle pierces the parietal pleura, this causes a sudden sharp pain, and if the needle enters the lung, blood may escape from the needle. The puncture of the pleura or lung is of no importance, but if the novocain is injected unintentionally the operator is made aware of this fact by the symptoms produced. If the fluid is injected into the pleural cavity the patient coughs, if injected into the lung, the patient experiences a bitter taste, but in either case there is no cause for worry. However, it is for this reason that the fluid should be injected very slowly, especially when beginning each injection.

Being satisfied that the position of the needle is correct, the syringe filled with 1 per cent. novocain-adrenalin solution (15 drops of a 1 : 1000 adrenalin solution are added to every 100 c.c. of freshly prepared 1 per cent. novocain solution) and 5 to 6 c.c. of this solution are slowly injected; half of the amount is injected without moving the point of the needle, and the remaining half is injected while the needle is slowly withdrawn, but before the point of the needle reaches the lower margin of the rib.

Each of the nerves is anesthetized in exactly the same manner. The anesthesia that results extends anteriorly to within about 1 inch of the median line.

When the anesthesia was complete an incision about 13 cm. long was made over the ninth rib on the right side extending anteriorly to the posterior axillary line, the incision going right down to the rib. About 10 cm. of this rib was resected subperiosteally, and then the same length of the tenth rib was similarly resected. It was found that the visceral pleura was adherent to the parietal pleura. Had this not been the case, I planned to cause such adhesions to form by packing in iodoform gauze, forcing the parietal pleura against the visceral pleura, and then waiting twenty-four to forty-eight hours before incising, so that the free pleural cavity would be walled off by adhesions. As, however, firm adhesions were present and no respiratory mobility of the lung could be made out, I made a small incision through the parietal pleura, the visceral pleura, and the diaphragm, all of which were fused together and thickened, and at once thick mucopus escaped. This was not allowed to escape rapidly. When the pressure had been reduced the incision through the diaphragm (Fig. 411) was extended the entire distance that the ribs had been resected in order to get very free drainage. About 1000 c.c. of pus came away. When pus no longer escaped, the large cavity was irrigated with sterile normal saline solution until the fluid returned clear. Then two large rubber drainage-tubes were introduced and held in place by suturing each to the skin by a single silkworm-gut suture and two Dakin tubes were introduced, one at either extremity of the incision through the diaphragm, to be used after twenty-four hours for Dakinization of the cavity. The skin incision was closed by means of two silkworm-gut sutures, one near either extremity of the skin incision (Fig. 411) and copious dry dressings were applied.

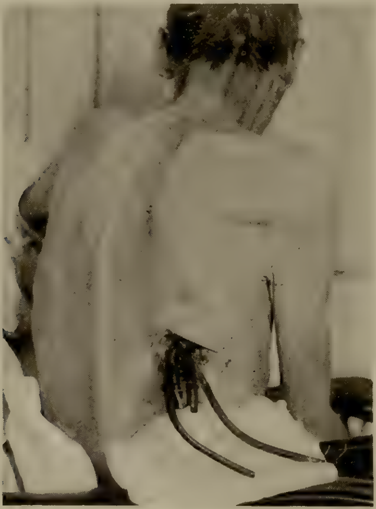

Fig. 411.—Photograph of patient taken after he was up in the wheel chair showing drainage-tubes and Dakin tubes in place.

The case presents two instructive features. First, the patient presented two independent abscesses, each of which required a separate incision for proper drainage. Second, and perhaps the more interesting point, is that the patient withstood the minor operation badly under general anesthesia, whereas he stood the more extensive and longer operation very well under paravertebral anesthesia. Following the first operation in which ether was administered for only twenty minutes and in which merely an incision was made into the abscess of the abdominal wall, without entering the peritoneal cavity, the pulse at the end of the operation had risen from 86 to 158 and respirations from 24 to 40, whereas after this second operation, which was performed under paravertebral anesthesia and was very much more extensive, lasting one hour and fifteen minutes, the pulse, which was 80 before the operation, only rose to 118 and the respirations from 26 to 30. This is conclusive evidence that the patient suffered no pain.

The abscess cavity was irrigated with Dakin's solution every two hours daily until the discharge was slight. Recovery was uneventful. The patient was allowed to be up in a wheel chair on March 15th (eleven days after the subphrenic abscess was drained), was able to be up and about the ward March 25th (three weeks after the operation), and was discharged on April 17th, cured.

CLINIC OF DRS. ALBERT J. OCHSNER AND FRANK H'DOUBLER

Augustana Hospital

COMPRESSION OPERATION FOR TREATMENT OF UNILATERAL PULMONARY TUBERCULOSIS

History of Case Presented. Technic of Operation. Selection of Cases. Anesthetic Employed.

Among the scores of thousands of patients suffering from pulmonary tuberculosis there are thousands who present ideal conditions for the operation performed upon this patient. Their comfort would be enormously increased and their lives prolonged for many years if they were subjected to this treatment.

A sufficient amount of clinical experience has now been accumulated to lay down definite rules to guide the surgeon and the tuberculosis specialist so that practically no harm will be done, while the benefit to this class of patients will increase as the experience, now possessed by only a few surgeons, will become the property of all general surgeons who are accustomed to doing major surgery.

No doubt further experience will develop important new details, but this form of treatment has completed the experimental stage in the hands of a number of surgeons of enormous experience, whose skill and judgment are equal to the very best in the world, and whose conclusions may be accepted with perfect confidence. Among those who have done most to develop this treatment to its present stage we find Friedrich, Sauerbruch, Wilms, Clairmont, and Archibald, whose writings are of intense interest.

The method has resulted most favorably where a great general surgeon has worked hand in hand with a great tuberculosis specialist, because this combination guarantees the four most essential elements: (1) proper selection of cases, (2) proper preliminary treatment, (3) careful conservative operative treatment, and (4) intelligent after-treatment.

History of Case.—Date, June 28, 1921. Name, Mr. H. A. W. Age, forty-one.

Nationality.—American.

Occupation.—Previous to twelve years ago operated a calendar machine in rubber factory, which was dusty and poorly ventilated. He quit this and went into real estate because of injury to the left arm and elbow.

Family History.—Maternal aunt died of tuberculosis.

Marital.—Married fifteen years. Wife and 3 children living and well. One child died at two of typhoid and tuberculous meningitis. One child died of endocarditis. One miscarriage before first child.

Operations.—Appendectomy, 1916, for acute attack.

Habits.—No alcohol or tobacco. Before present illness moderate smoker.

Previous Illnesses.—Measles, mumps, whooping-cough, and chickenpox in childhood. Abscess of left ear following influenza in 1918.

Head, *eyes*, *nose*, *teeth*, *throat*, and *gastro-intestinal* negative.

Rectal.—Two and a half years ago had an abscess at side of rectum. This subsided, leaving a fistula, which is not painful and which oozes a few drops of thin gray fluid each day.

Venereal.—Negative.

Neuromuscular.—Negative.

Present Illness.—Sixteen years ago the patient had a cough with pain in the right side of the chest and night-sweats, and was run down. After about one year he had recovered from this and was well until he had influenza in October, 1918. Immediately after this he had pneumonia, and was dangerously ill for three weeks. Ever since he has had a cough, very slight chest pains on the right, sweating during sleep, afternoon flushing and malaise, and he has remained in a run-down condition and is very easily exhausted. During this time he has had thirty-five pulmonary hemorrhages and countless minor ones. Last hemorrhage occurred December, 1920. He raises very little sputum, sometimes foul smelling. Tubercle bacilli frequently found. Two years ago went to Arizona for treatment, and returned to Akron, Ohio, June 15, 1921. Gained 30 pounds in Arizona, but has in last two months lost 10 or 12 pounds. The left lung has been repeatedly pronounced healthy on physical examinations.

Physical Examinations.—Well developed and fairly well nourished. Color good. Skin clear.

Head, *nose*, *teeth*, and *throat* negative.

Eyes.—Pupils equal and react, but are widely dilated.

Ears.—Negative to external examination, save for slight impairment of hearing on the left side.

Chest.—Sunken below right clavicle. Right side of chest moves less than the left. Respirations 24 per minute.

Lungs.—Right lung dull to flat everywhere, with increased vocal and tactile fremitus. Breathing is everywhere bronchial in type, and in the region of lower angle of scapula breathing is amphoric, with positive "cracked-pot" sound. No râles over the upper portion of lung, but there are fine numerous râles at the base.

Left Lung.—Apparently free and negative to inspection, palpation, percussion, and auscultation.

Heart.—The heart lies entirely to the right of the midsternal line, and its borders cannot be outlined. Sounds of good quality and rhythm. Rate, 96 per minute. No murmurs.

Vessels not thickened. Tension not increased.

Abdomen.—Appendectomy scar. No masses, tenderness, or herniæ. Spleen, kidneys, and liver not felt.

Genitalia.—Negative. Left testicle normally lower than the right. Both testicles and epidydimi negative.

Rectal.—Small fistula on right side with moderate induration.

Extremities.—Clubbing of fingers. Otherwise negative.

Reflexes.—Lively and equal on the two sides.

Urine.—Negative.

Sputum.—Examination positive (++) for tubercle bacilli. No odor or blood.

Wassermann.—Blood negative.

x-Ray of Chest.—Right lung completely diseased, and apparently solid throughout save for a shadow suggesting cavity near lower angle of scapula.

Left lung shows fine mottling here and there, but no definite area of consolidation or caseation.

The *heart* lies entirely to the right of median line.

Diagnosis.—Pulmonary tuberculosis, right side, with cavity. Displacement of heart to right. Fistula in ano.

Figure 414 shows the left lung practically normal.

Operative Notes (July 1, 1921).—Resection of sixth to eleventh ribs; $\frac{1}{4}$ gr. morphin and 1/100 gr. of atropin one hour before operation, and $\frac{1}{6}$ gr. of morphin and 1/150 gr. of atropin just before operation have rendered the patient drowsy and indifferent to everything save pain.

Local anesthesia, with blocking of intercostal nerves, using $\frac{1}{2}$ per cent. apothecine solution. The technic is as follows: First, we inject the skin along a strip parallel to the spine, and with its center line 2½ inches from the spinous processes. The width of the strip injected should be 1½ to 2 inches, and its length should extend from below the twelfth rib to several inches above the fifth rib. Next comes the blocking of the intercostal nerves, which is done by starting with the lowest intercostal space and proceeding to the next above, and so on. Through the skin, which has already been injected, a long needle is inserted till it strikes the rib, then the needle is tilted and its point made to seek out the lower edge of the rib where the intercostal nerve lies, and here 5 c.c. of the solution are injected; it is well to slightly withdraw the needle and to again seek to inject the nerve at a point either medial or lateralward to the first; indeed, to insure anesthesia, each nerve should be injected at least at three separate points, which is possible to do by angling the needle, and thus without piercing the skin each time. One of these three injections should reach medianward as far as possible, and here it must be remembered that the nerve lies halfway between the ribs rather than just below the lower margin, as shown in Fig. 412. When an intercostal nerve has been injected it is well to leave the needle *in situ*, and before removing it to seek the next rib and nerve with another needle. During the operation we may or may not have to infiltrate one of the nerves again. We make it a rule to infiltrate two nerves above the limit of the first-stage operation.

The Operation.—A sweeping longitudinal incision is made along the center line of the infiltrated skin. It is carried down to the ribs. The many cut and bleeding vessels are caught with hemostats as we go, for these patients should not be allowed to lose much blood. We are now down to the ribs, and the patient has so far experienced no pain. Next the periosteum is loosened from all of the ribs which are to be resected, namely, the eleventh to the fifth ribs inclusive. In so doing we must be careful to avoid injuring the pleura. If the pleura should be pierced the hole may be stopped by pressure with gauze, with or without sterile vaselin as the case may require, and later sutured. Should the patient cough during the operation, thereby bulging out and endangering his pleura, we simply exert pressure with gauze and request the patient to cough. After several

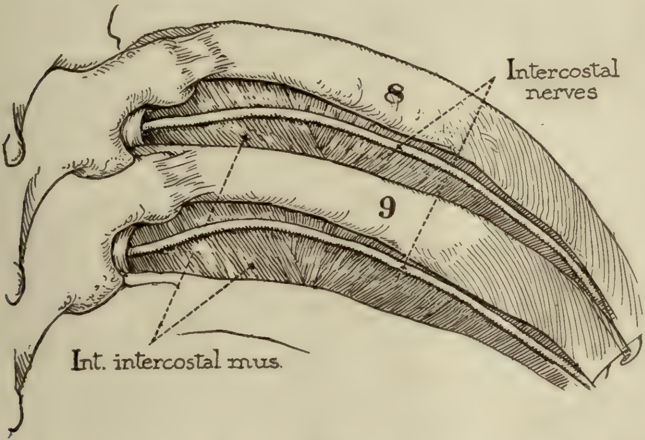

Fig. 412.—Location of intercostal nerves. Note relation of nerve to lower margin of rib.

attempts he cannot cough if he wishes to, and we can proceed without trouble. During the stripping of the seventh rib the patient shows slight pain, so we will infiltrate the nerve again. The ribs are all ready for resection. We start at the lowest, and with the special rib scissors (Fig. 413) resect 10 cm., and quickly proceed to the next rib, and so on, taking slightly shorter lengths each time. As each rib section is removed, the exposed pleura is covered with a large pad of gauze under slight pressure. We stop at the sixth. Ligatures are applied and a long split rubber drain laid in the wound. Over the drain muscle and fascia are closed. The drain is brought out through the lower end of the wound, and the skin is closed with catgut. Two layers of gauze are placed over the wound, and with wide strips of adhesive, which encircle the chest entirely, the latter is

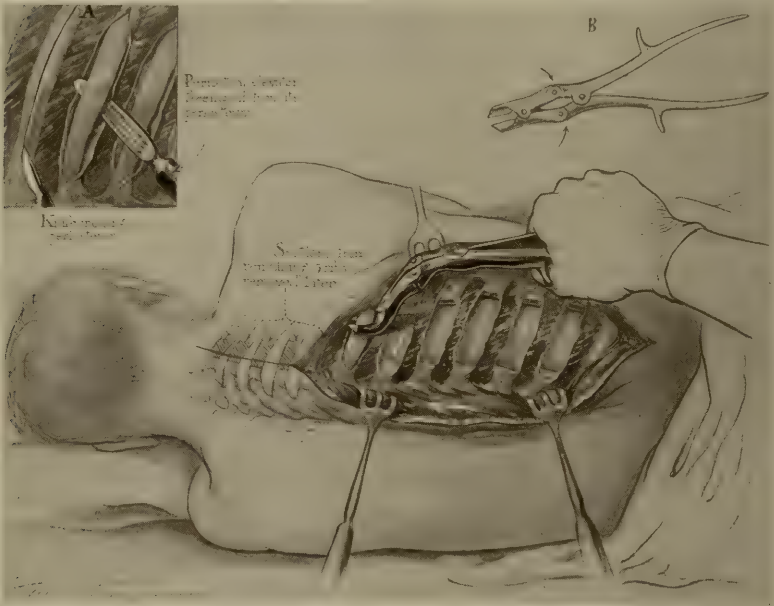

Fig. 413.—Resection of eleventh to sixth ribs—the "first-stage operation." *A*, Ribs completely stripped of periosteum. *B*, Flat view of special rib cutter designed by Professor Einar Key, of Stockholm. Note double leverage.

securely strapped so as to collapse the right side. The straps are left undisturbed for several weeks, the drain being simply pulled out from below the lower end of the dressing at the end of a week. The skin stitches, being catgut, require no attention. The strapping of the chest is important, for if it is done shiftlessly the results of the operation will not be up to expectation. The patient is held in a sitting position with arms partially abducted, then the straps are securely applied after expiration. The right side is thus held in collapse.

The operation seems so easy to do that one is always tempted to do the whole affair in one stage. Experience has taught us, however, that this is dangerous, so that we always employ two stages no matter how tempted we are to continue during the first stage. The patient now is in excellent condition. Were we to continue he might not survive because the total of shock would be too great. He will be sent to his room as he is. The head of his bed will be elevated 18 inches to prevent hypostatic pulmonary congestion. He can begin at once to take large quantities of water, this being another advantage of the local anesthetic. He will be given urotropin, 5 grains, every two hours, dissolved in a glass of cold water. His feeding will be forced, of wholesome food best suited for tuberculous patients. Later, when his condition warrants, we shall resect the remaining ribs.

August 2, 1921. Clinical Notes.—Following the first-stage operation the patient had moderate fever for a week and a half. Since then his temperature has been normal. The wound is perfectly healed. The heart functions well, and the left lung continues to be negative to physical examination.

August 3, 1921. Resection of Fifth, Fourth, Third, and Second Ribs.—The anesthesia is accomplished in the same manner as during the first stage. First, a strip of skin is injected parallel to and 2½ inches distant from the spinous processes; ½ per cent. solution of procain is used. Next the intercostal nerves are injected, from the sixth to first, inclusive. As during the first-stage operation, the nerves are reached just at the under edge of each rib. The incision is made extending from the fresh scar to the first rib. It is carried down to the fourth, third, and second ribs, which are stripped of periosteum and from which are resected portions varying respectively from 6 to 4 cm. in length. Closure and drainage and strapping are carried out as described under the first stage. The postoperative care will also be the same.

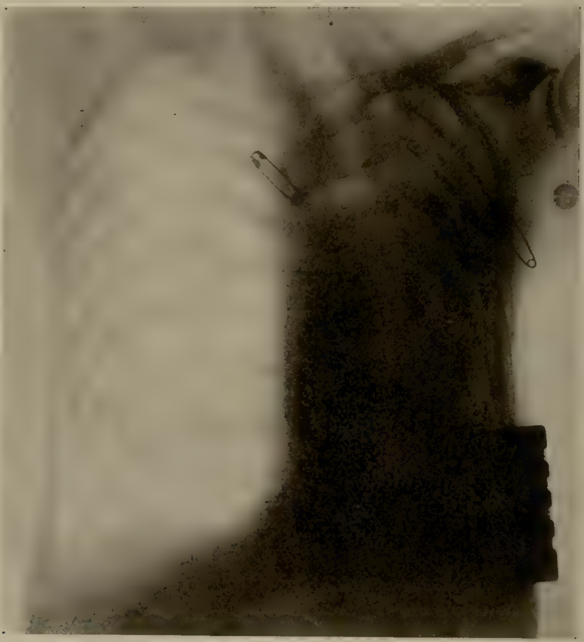

Fig. 414.—Chest plate of case reported after the two-stage operation. Note absence of heart on left side. The position of the right ribs posteriorly after the collapse can be seen.

September 15, 1921.—Since the second stage of the operation the patient has done well. He has been able to be up and is fever free. He does not cough and his sputum only occasionally shows a few tubercle bacilli. He has gained in weight and feels well, though still tiring easily.

The *heart* still lies to the right. It functions well, and the *left lung* remains negative.

The *x*-ray (Fig. 414) shows the collapsing effect of the operation on the right side, and the effect on the cavity near the lower angle of the scapula.

The patient is discharged much improved, and advised to return to Arizona.

January 1, 1923.—At Christmas, 1922 patient is still improved, and has held an 8-pound increase in weight. No mention is made of sputum or hemorrhages. He writes from Arizona.

There are certain important details which must be borne in mind in connection with this form of treatment in order not to do harm to the patient.

1. *Selection of Cases.*—(*a*) The patient must have one lung in a fairly normal condition, because if this is not the case the disease will make very rapid progress following the operation, and the patient's life is likely to be shortened.

(*b*) The patient's general condition should be such as to insure a fair amount of resistance against the shock of the operation.

(*c*) The patient should belong to a class in which efficient gas compression cannot be accomplished.

(*d*) The patient should be as nearly free from fever as possible.

(*e*) He should be accustomed to the bed by being kept in the recumbent position for a number of days before the operation.

(*f*) The condition of both lungs should be carefully studied by physical examination, and by the study of well-made *x*-ray plates.

2. *Anesthetic.*—The anesthetic should be preceded by the hypodermic administration of morphin and atropin, or morphin and scopolamin.

Local anesthesia with ½ per cent. of novocain, or one of its equivalents, is much to be preferred because the patient can assist in breathing according to direction during the operation. There is no danger from aspiration pneumonia and no danger from irritation of the lungs due to ether. Chloroform is much less likely to irritate the lungs, but is infinitely more dangerous than ether.

If ether anesthesia is employed, it is wise to operate with the patient in a sitting position, well supported on a table arranged for this purpose, because much less anesthetic is required because of the anemia of the brain due to the position, and the patient is much less likely to inspire pus into the healthy lung due to compression of the diseased lung during the operation. Local anesthesia, as described above, is so simple, safe, and satisfactory that we always use this method in preference to general anesthesia.

Hemorrhage.—These patients do not bear the loss of blood well, and consequently every bleeding vessel should be clamped at once, and all oozing should be prevented by pressure with gauze pads.

Perforation of Pleura.—It is usually possible to avoid perforating the pleura by carefully stripping the periosteum of the ribs before resecting. We are in the habit of thus freeing all the ribs to be resected at one sitting before any of them are cut, because then one can tampon the gauze against the pleura and make gentle gauze pressure as one rib after the other is cut away.

There is some danger of the patient bursting the pleura by violent fits of coughing. In case the patient begins to cough, the operation should at once be interrupted, and gauze should be placed against the pleura and held with gentle pressure, and the patient should be directed to cough more. Strange as it may seem, these patients have always stopped coughing almost at once upon being asked to cough more, while they have not been able to stop coughing if requested to stop.

Number of Ribs to Be Resected at One Sitting.—There is great danger in doing too much at one sitting. Patients often seem to be in such excellent condition that the surgeon feels inclined to remove portions of all the ribs at one sitting, but this is taking unnecessary risk because these patients may collapse at any moment, and this may prove fatal. We now limit the number of ribs to be excised at one sitting to six, and in less vigorous patients we sometimes resect only three or four at one sitting. It is best, however, not to postpone the subsequent operation longer than six weeks.

Strapping of Chest.—We have found it much more satisfactory to pass the rubber adhesive straps entirely around the chest, because the patient will then breathe with the good lung by using the diaphragm, and this form of strapping immobilizes the diseased lung much more perfectly, and by using catgut for suturing the skin and permitting the drainage-tube to project from the lower end of the wound so that it can be withdrawn on the second or third postoperative day without disturbing the dressing, the primary immobilization may be left undisturbed for several weeks.

By observing all of these details this operation promises to become exceedingly useful to a large number of patients, who are now thoroughly disabled and whose lives can be greatly lengthened and who can again take up their former occupations. Of course, every care must be given to hygiene and nutrition in these as in all other cases in which tuberculous conditions have been relieved by surgical treatment.

CLINIC OF DR. LEWIS L. McARTHUR

ST. LUKE'S HOSPITAL

REPAIR OF THE COMMON DUCT

Presentation of Five Cases Illustrating a Method of Common Duct Repair. Review of the Literature on This Subject.

I WISH to discuss with you this morning the subject of common duct repair and present some cases illustrating the method of repair employed. The first patient was referred to me by Dr. Lewis, of Dubuque, Iowa, who gave me the following history:

A man of middle age (forty-eight) who, while seeking operation for a simple right inguinal hernia at a neighboring clinic, awoke to find that an appendectomy and the removal of a stone from the gall-bladder added to his herniotomy had been done. With a biliary fistula persisting for a year, he returned to the clinic, when a cholecystectomy was done, with prompt recurrence of the biliary fistula. After another year's interval of alternate opening and closure, followed by jaundice and fever, he returned for the third time to the clinic for search for the source of common duct obstruction. During this fourth interference so severe a hemorrhage occurred as to make it necessary to desist, leaving the hemostatic forceps *in situ* and packing the wound, returning the patient to bed to recover from loss of blood, shock, etc. The patient recovered and the wound healed (with the fistula persisting); he returned home. While the fistula was draining the patient was comfortable; when closed for three or four days there was recurrence of jaundice, chills, fever, and common duct symptoms. After a lapse of several months the patient was brought to me.

With the above history, an exploratory operation was made, following with great difficulty the course of the fistulous tract through a mass of adhesions of the stomach, liver, colon, and duodenum, to its source in a small remnant of the cystic duct big enough to admit the index-finger tip. and containing mucopurulent bile with black biliary grit. Splitting open this pouch and its communication with common duct, the latter was found dilated above this point sufficiently to permit palpation of right and left hepatic branches; below this point an average-sized probe could be passed down into the duodenum. Two stones could be felt, and were removed from the dilated common duct with mixed mucopus and grit. With the probe down the common duct, palpation revealed the duct, surrounded by much indurated cicatricial tissue, but, as the duct was patulous to probe and fluids, no effort was made to remove the narrowed portion or to divide the same. A No. 6 soft-rubber catheter was passed down into the duodenum and the wound was closed after excision of the remnants of the cystic duct.

Recovery was uneventful. The catheter was utilized while *in situ* to flush out the circulatory system and kidneys by introduction of 2 to 3 liters of sterile water daily into the duodenum, this clearing up the jaundice rapidly. The patient returned home in seven weeks with the wound closed.

For four months following his return home the patient had occasional attacks of obstructive symptoms with septic reactions. At the end of the four months the wound was reopened and a stricture found below the formerly opened area, the common duct being this time opened nearer the duodenal junction. The probe passes easily into the duodenum. When trying to probe upward stricture found that admits only the smallest size probe. Divulsion of stricture and excision of scar tissue sufficient to admit No. 16 English sound. On splitting open the stricture several small black biliary calculi are discharged, with free flow of bile. Insertion upward into dilated duct of rubber tube with double reverse cuff; fastening same there with chromic gut, then passage of other end well down the duct into the duodenum, so that 6 to 7 inches are free in duodenal lumen. Wound closed with cigarette drain down to junction of duct ends.

Healing was uneventful; no bile escaped through wound; patient returned home in five weeks; all symptoms had disappeared.

Sixty-three days after its insertion the tube was passed. The patient never had a recurrence of the old symptoms, and died some years later with a carcinoma of the stomach.

The second patient, Mrs. B., entered St. Luke's Hospital for obstruction of the common duct, with jaundice. Reopened the abdomen through old incision for cholecystectomy. No stones palpable in common duct. Pus, blood, albumin, bile, and casts (hyaline and granular) in urine. Quick insertion of 2 tubes at point of probable ligation of former cystic duct, where stricture was found and split. One tube was inserted toward the liver in proximal end, and one downward toward the duodenum, and the wound hurriedly closed, the aim being to relieve cholemia by the simplest procedure. Recovery was good, but there was some intermittent jaundice; itching was gone at the end of the week. One month later she was still somewhat jaundiced.

Second operation was performed six weeks later. Fistulous tract injected with methylene-blue, and tract followed through adhesions to the common duct. Opening in it was enlarged sufficiently to insert a $\frac{3}{8}$-inch rubber tube into the duct. On the upper end a cuff or reverse had been turned back in order to enlarge its caliber and retard its escape into the duodenum. The tube was about 4 inches long. The common duct was sutured over the tube at the slit in the stricture. The wound closed with drainage. Wound closed on the eleventh day. Stools became dark and urine light. Discharge on the nineteenth day.

The third patient, Mrs. S., presented a typical history of biliary colics, nausea, vomiting, and jaundice. Gall-bladder was drained seven years before, after removal of stones. Reoperation revealed an hour-glass stricture of the gall-bladder. Compartment at fundus filled with stones below stricture (probable former purse-string site). The gall-bladder was thickened and infiltrated. The cystic duct was ligated with artery and vein, and cholecystectomy made. The drain was inserted down to the stump. There was free flow of bile on second day. The wound healed.

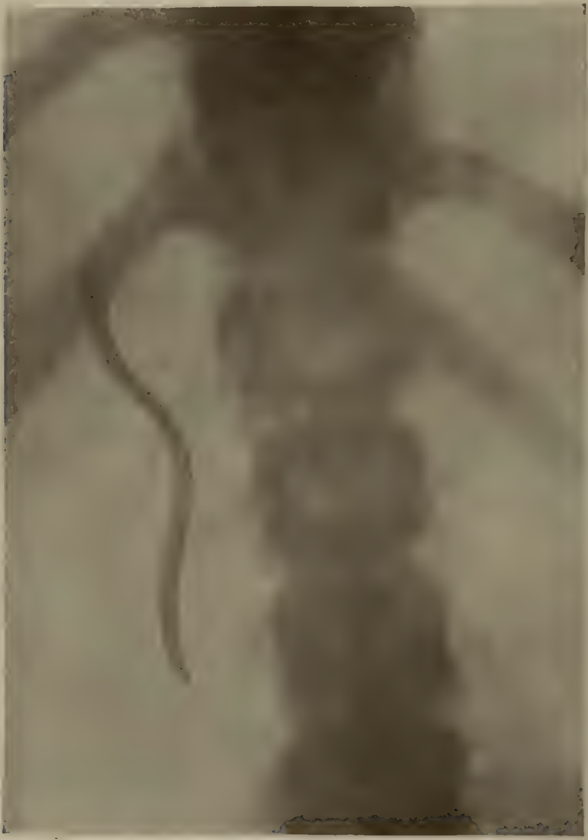

Fig. 415.—Case III. First tube too short. In place nine weeks. Second operation; full-length catheter inserted, and passed by bowel on the twenty-seventh day.

Five months later the patient was sent to the hospital with a chill and fever; leukocytes 15,400, pulse 100, temperature 102.4° F., urine highly colored; stools light colored. The temperature was normal on the fourth day and the patient was discharged on the sixth day.

The patient returned to the hospital in two months with jaundice, nausea, and vomiting; pruritus.

Operation.—The abdomen was opened through the old scar. The common duct was identified and opened. The probe passed downward easily into duodenum without obstruction; passed upward to meet the obstruction near the hilus of the liver. The duct was split upward along the probe to the obstruction, due to connective-tissue constriction and scar tissue. A portion of a No. 7 soft-rubber catheter was inserted with funnel above the constriction, and the other end was passed down duct into duodenum and then sutured over catheter, and a Bullitt drain inserted to the field of the suture. Drain was removed on the seventh day, stools normal on the second day.

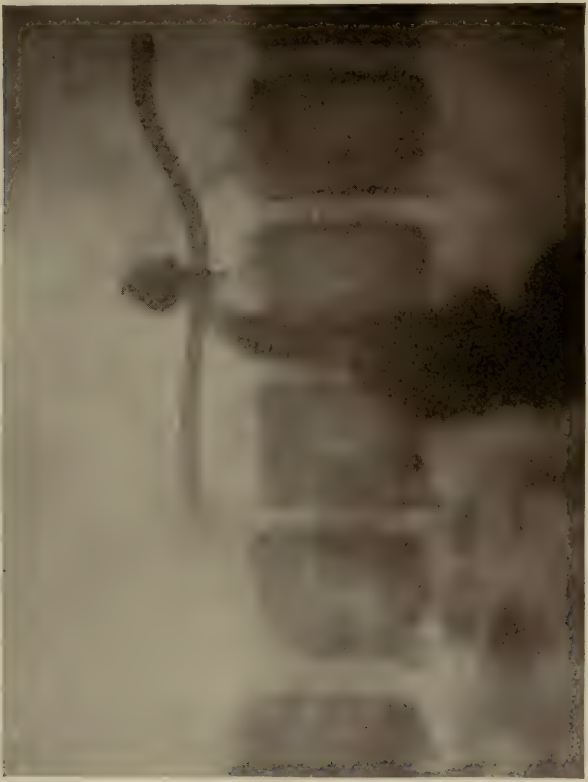

Fig. 416.—Case III. Same, with bismuth in duodenum.

After one and three-quarters years of comparative comfort the patient again showed jaundice. The abdomen was then reopened. The common duct was reached through the adhesions without seeing free peritoneum. Opening the same revealed a black silk suture as the nucleus of a gall-stone at site of former stricture. It was deemed advisable to suture the proximal end of the common duct to a new opening in side of the duodenum. This was done by inserting a purse-string suture in the duodenal wall, passing nearly the whole catheter down the duodenum through the small button-hole incision, and tightening the purse-string suture. The funnel end was inserted in the proximal end of the common duct above the stricture, and the common duct end was sutured to the duodenum by four fine silk sutures. A drain was inserted to the bottom of the wound and removed on the seventh day. The patient was discharged on the sixteenth day. Tube passed the twenty-seventh day.

The fourth patient, Mrs. M., aged twenty-nine, married, was operated on ten months previously for gall-bladder disease; then again six weeks later. For four months there were intermittent jaundice, pain and vomiting, and the stools were clay colored. Stricture of the common duct was found, and opened. A tube was inserted with the cuff turned back for the proximal end; the other end was carried down into the duodenum; the duct was sutured over it; the wound was closed with drainage. Recovery was prompt, with relief of symptoms. The tube was passed in nine weeks.

The fifth patient, aged thirty, married, and had 2 children. There was frank gall-stone disease, associated with occasional jaundice. No previous operations. The simplest type of cholecystectomy was done, following the best known technic of subperitoneal resection of the cystic duct after satisfactory isolation and identification of both artery and duct. I never did a more comfortable, easy cholecystectomy. There were many stones. After the wound was closed and the patient was in bed inspection of the specimen showed a peculiar $\frac{1}{4}$-inch tubular structure attached to one side of the cystic duct portion of the gall-bladder. Immediate frozen section showed it to be lined with epithelium similar to the duct. I immediately realized my mistake, told both the family physician, who had watched and complimented the careful operation, and the relatives frankly what had happened, and explained the necessity of immediate opening of the wound to resuture the duct. This was done. The ends of the duct were picked up and the catheter was passed down almost entire into the duodenum through the distal portion. Inasmuch as there had never been any dilatation of the common duct, it was not feasible to insert upward the funnel end of the catheter, so the funnel was amputated, and the cut end passed up to the liver. In order to anchor it in place a medium-sized wax silk ligature was tied to the catheter at the area uncovered by the duct and anchored to the surface of the skin by adhesive plaster; then the ends of the ducts were approximated toward one another to within ½ inch. The wound was sutured. Some bile discharged until the anchor thread was cut four and a half months after operation. The catheter passed seven weeks after thread was cut (Fig. 417). The wound ceased leaking in ten days after the thread was cut. The patient was then apparently perfectly well and remains so.

Disregarding free fascial transplants as having the proved but temporary successes, and avoiding the much more serious surgical procedures of Walton and Mayo, there remains the utilization of some form of tubular reconstruction.

I first employed this method in 1907. Search through the literature fails to reveal earlier application of this method of correction of common duct defects, and not until 1909 did Sullivan report the results of his laboratory experimental work along these lines. In an analogous manner, in November, 1905, Jenckel, of Germany, endeavored to establish a new canal by using a tube, one end of which was sutured in the proximal duct, the other inserted through an opening into the duodenum, made after the Witzel method for temporary gastric or intestinal fistula—that is, by burying the tube by suture in a fold of the duodenal wall for 1 or 2 inches before perforating the same. The great value of Witzel's suggestion is quick obliteration of the temporary tract and closure of the fistula on removal of the tube. The very thing to be avoided, then, in establishing a new channel of this nature. In point of fact, in the case mentioned, Jenckel after three weeks inserted his finger into the fistulous tracts to remove the tube, and by traction on it tore open the duodenum along the Witzel suture, with a resulting desperate duodenal fistula and extremely tedious convalescence. Strangely enough, after months the wound epithelialized internally sufficiently before it healed externally to establish a nexus between the proximal stump and

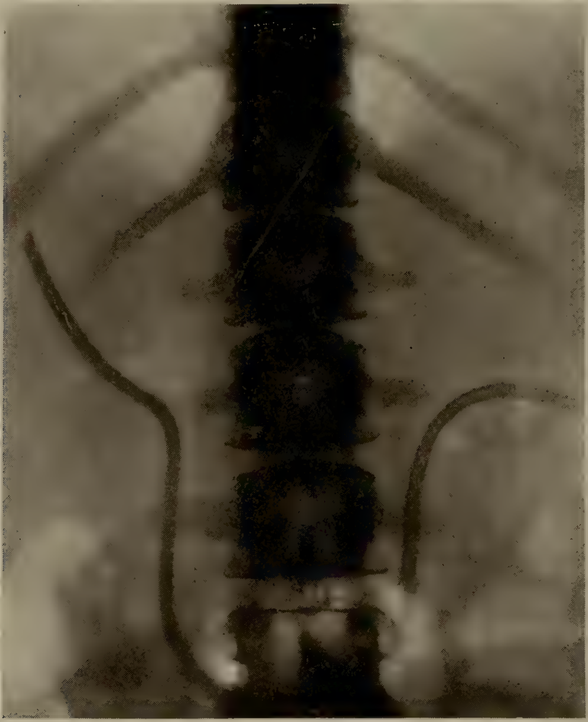

Fig. 417.—Case V. Full-length catheter in duodenum and duct. Anchored by silk thread to adhesive plaster on surface. *In situ* four and one-half months. Anchor suture cut September 14th; tube passed by rectum November 7th.

duodenum! So that after more than a year's time the patient was discharged cured.

Following Sullivan's early recommendations there came many applications of the same in practice, usually with some means for the removal of the tube, like the well-known T-tube, now largely abandoned because many times the short arm of the T-tube has broken off in the duct during the effort to extract it, thus necessitating another surgical interference. If a T-tube be used, a caution should be voiced as to the danger of rotting very quickly the rubber by the injection of vaselin or oils after Bevan's suggestion, as tubing is very speedily rendered friable thereby. The tying of the strong ligature to the tube *in situ*, so that it may be pulled out after some months, has the disadvantage of tearing open the newly formed duct, with a potential recurrence of stricture. The recommendation to leave a short tube permanently in place is to be condemned because of the ultimate deposit of bile, with recurrence of symptoms as in the second patient.

As yet I have found no reference to the dependence on an enlargement of the proximal end of the tube sufficiently to delay its escape until the tract can epithelialize, nor any suggestion of utilizing the "duodenal tug" of every peristaltic wave finally to make it pass off by the bowel. These two factors are, in my opinion, most important to the successful outcome of one of the most difficult procedures the surgeon meets with.

The ordinary soft-rubber catheter with its funnel-shaped end, or the soft-rubber catheter a demeure trimmed to suit, meets these indications better than anything else I have used. Always at hand and in assorted sizes to meet the individual case, one need not resort to any special device. In the vast majority of cases the proximal end of the duct is so well dilated that the funnel end, by simply folding on itself, can be inserted proximally and then held there by a chromic catgut encircling suture, the balance of the catheter having been passed through duct previously wholly into the duodenum. The ends of the duct are then approximated as well as possible by sutures and the wound closed with a cigarette drain.

In the few cases in which the repair of the common duct is to be made immediately following the accidental or intentional removal of a segment, the proximal end of the duct is often no larger than the distal end, and will not permit the introduction of a cuff or funnel. In the fifth patient I was successful in overcoming this difficulty by temporarily anchoring with a single silk thread tied around the catheter, brought out through the incision, and attached to the skin with adhesive. Held thus in place four and a half months the tube passed seven weeks after cutting the anchoring thread.

Only too frequently it happens that the obstruction has existed so long it proves impossible to discover the distal end of the duct, atrophic and buried in adhesions and scar tissue. When this is the case, either the method recommended by Walton and by Mayo of a pedunculated flap of duodenal wall containing all three layers should be sutured to the proximal end of the duct, and the duodenum mobilized so as to be sutured well in contact with same. When this cannot be done then with the tube introduced into the proximal end and fastened there as before suggested, the balance of the catheter is inserted in the duodenum through an opening, previously encircled with a good silk purse-string suture, made in that part of it most easily brought up to the proximal end of the duct. By this means I have twice overcome the difficulty. Painstaking efforts, however, should be made to find the distal end, and only then abandoned when further efforts would seem to jeopardize the patient's life, because no anastomosis of duct to stomach or duodenum is as free from danger of an ascending infection as is the ampulla of Vater. Two of the cases reported, of the latter type, while showing no jaundice and no clay-colored stools, have had, from time to time, all the symptoms that attend a moderate cholangeitis, chill, fever, malaise, nausea without jaundice, or bile in urine, while those in whom it was feasible to utilize the ampulla have been much more free from these disquieting reminders of their old ailment.

CLINIC OF DR. GATEWOOD

Presbyterian Hospital

MIXED TUMORS OF THE PAROTID GLAND

Patient Presenting a Tumor of the Right Parotid Gland. Differential Diagnosis. Operation. Result.

From several standpoints the case I am about to present to you is of considerable interest. First, as to diagnosis, which I think is fairly easily made. Second, as to prognosis, which may depend upon microscopic findings, and third on account of the peculiar nature of these tumors.

This man is thirty-eight years old, white, and single. His general health is good and he is steadily adding weight to his already obese body. About four years ago he noticed a small swelling just in front of his right ear. This was gradually increased in size until it is now, as you may see, about the size of an English walnut. While the patient thinks that the growth has been intermittent, it has been progressive, and apparently more rapid during the past six months. He has had no pain of late, but states that there was slight soreness at the time he first discovered a small lump. Eating has no influence upon the size of the tumor.

This mass, you see, is firm and almost smooth in outline. It is not tender. It is located in the region of the right parotid gland and extends backward to the base of the ear. There is a slight irregularity in the outline of the posterior portion of the mass. While the tumor is fairly fixed, it seems separable from the mandible, thereby excluding bony tumors of the jaw. We should have some notion of the pathology of this tumor before we proceed to operate. What are we to consider? Naturally, the duration would exclude even the most chronic inflammations, although we occasionally see a low-grade parotitis lasting over months. Tuberculous lymph-glands in this vicinity are not uncommon, but are almost always multiple, and the absence of other glands, taken together with the long history without inflammation, eliminates tuberculosis from consideration.

Salivary calculi weighing 30 to 60 grams have been reported. These stones usually give early symptoms of duct obstruction, and nothing is more characteristic than to see a salivary gland increase in size with accompanying pain when a patient is given a lemon to suck. Patients with salivary calculi give such a typical story of pain and swelling after eating that the diagnosis is usually readily made on the history alone. Stones, as a rule, conform to the shape of the ducts and are not globular in form except when small.

A *retention cyst*, either as the result of stone occlusion of a duct, or following an inflammation is not uncommon. Cysts are almost always fluctuant and vary definitely in size from time to time. Fluctuation does not exclude neoplasm, however, for cysts are common even in carcinoma. Of the neoplasms, we must consider adenoma, carcinoma, sarcoma, and the so-called mixed tumors.

Benign adenomas of the parotid glands are very rare. They are slowly growing tumors, remaining encapsulated, and intimately connected with the gland. They may be solid or cystic, the cysts containing much mucus or serous secretion. They contain a moderate amount of stroma without trace of mucoid or cartilaginous material.

Carcinomas are much more common. They may occur as pure epithelial tumors or more often as a part of the picture of a mixed tumor. Whether transition from a benign to a malignant neoplasm occurs in this group, or the malignancy is primary, is still a much disputed question. Whatever the relation between the mixed tumor and the carcinoma may be, the clinical picture of each is very characteristic. Carcinomas develop rapidly, very early invading the entire parotid and giving regional lymph-node involvement. General metastases are common and prompt recurrence after extirpation is the rule.

Sarcoma of the parotid gland, according to a number of men like Kuttner, Koenig, and Kaufmann, is not uncommon, especially as a part of the mixed tumors. They have described four forms, namely, simple sarcoma, fibrosarcoma, myxosarcoma, and chrondrosarcoma. Koenig and Kaufmann state that these types may be intermingled, the same tumor frequently containing various soft elements along with cartilage and even bone. Leaving out of consideration the lymphoid tumors, Ewing thinks that true sarcoma of the parotid has not been demonstrated, and that these tumors, usually considered as sarcomas, are, in reality, round-cell carcinomas. Whether of epidermal or connective-tissue origin these solid round-cell tumors form a distinct group whose growth is rapid and whose malignancy is marked.

The *mixed tumor* is by far the most common neoplasm of the salivary glands. There are many reports of such tumors in the literature, one man reporting as many as 60 cases. A review of the records of the Presbyterian Hospital for the last five years reveals at least 13 cases of parotid tumors in patients varying from sixteen to sixty-four years of age, the average being about thirty-nine years. Wood reported a rapidly growing mixed tumor in a child seven months old. The great majority occurs somewhere between twenty and forty. These tumors may be found in any of the salivary glands, although, according to Kuttner, 90 per cent. occur in the parotid. During the same period but one benign tumor of the submaxillary glands was found at the Presbyterian Hospital. According to Ewing most of these cases have a quiescent period preceding their active growth. One of the patients, whom I saw about four years ago, first noticed his tumor twenty years ago. The majority had noticed trouble for more than a year, the average duration being almost five years. In nearly all of our cases there was a history of rather rapid growth of the tumor a short time before they sought surgical relief.

From these various pathologic possibilities, what shall we choose? The location of the tumor, the history of its slow growth, the lack of fixation to the jaw, the absence of any lymph-node enlargement, and the theory of probabilities all justify us, I believe, in making the preoperative diagnosis of mixed tumor of the parotid, although a benign adenoma cannot be entirely excluded.

We shall now proceed to remove the tumor and discuss the pathology after we have sectioned it. I am carefully infiltrating the area with $\frac{1}{2}$ per cent. novocain to which has been added 1:100,000 adrenalin. I may produce temporary paralysis of the right side of the face by the novocain, and in that event it will be impossible to tell for some hours whether the facial nerve has been damaged by the operation. By making a curved incision just posterior to the lobe of the ear and extending below the mandible of the jaw, in this way, I am avoiding the facial nerve which, as you know, courses through the parotid gland. By strong retraction I am able to push the portion of the parotid containing the tumor into the wound. Fortunately, in this case we have to deal with an encapsulated tumor. In some instances the tumor is so intimately associated with the parotid substance that it is impossible to enucleate it. Sometimes there are several tumors in the gland. Of course, if one feels relatively certain that the tumor is malignant, a radical resection of the parotid and even of all of the tissues in the neighborhood should be done regardless of the resultant deformity. I have now enucleated the entire mass, which is about the size of an English walnut. There are only a few vessels to be ligated, the blood-supply not being very great. As I am closing the wound I will insert a small piece of collapsible rubber as a temporary drain. A snug bandage should be applied to prevent the formation of a dead space, or of a hematoma. We can remove this bandage and the drain at the end of forty-eight hours and leave the wound without dressing. I have handled face wounds without dressing for a long time, simply touching the wound with a little tincture of iodin on an applicator once a day, and have never had any infection as a result. You see our patient can whistle, showing that I have not injured the facial nerve.

Let us now proceed to examine the tumor. It is white and slightly irregular, but quite smooth in contour. On section it presents a rather characteristic appearance. Parts of it are granular, almost crumbling between the fingers. Other parts are more fibrous and slightly pink, showing the presence of a better blood-supply, and here it is homogeneous and pearly, but not hard. I feel that we can say without microscopic section that this is a typical mixed tumor of the parotid gland. The encapsulated growths, such as this one is, do not tend to recur after excision. Even those cases in which the tumor has been removed by morcellement frequently do not recur. Occasionally, however, those which are apparently quite benign will recur as late as nine years after excision. Wood reports 45 per cent. of recurrences in his series of 37 cases, of which 70 per cent. were checked by secondary operations. It is characteristic, however, that those tumors which have been operated on a number of times become increasingly more malignant, increasing in cellular elements and becoming more vascular. Even very large and rapidly growing mixed tumors in this region rarely invade the lymph-nodes before operation. After unsuccessful removal, on the other hand, the cervical glands may become progressively involved with extension at times into the mediastinum. Generalized metastases are quite rare except in rapidly growing carcinomas.

What do we mean by "mixed tumor of the parotid"? Generally speaking, we refer to a tumor of complex structure with epithelial elements in the form of strands, alveoli, or diffuse masses with tissues usually considered of mesoblastic origin, chiefly cartilage and cellular connective tissue. Any element may predominate, though all the cell types are represented.

The etiology and pathology of these tumors have been the subjects of much controversy for nearly half a century. While they were originally described as carcinomas, following the lead of Koenig and Kaufmann, they were considered sarcomas. Wartmann advanced the idea that they were derived from the lymphatic endothelium. The cells are small, often polyhedral, but may under pressure be flat or spindle shaped, and in some cases the cells reproduce a structure closely resembling the spindle-celled sarcoma. The presence of growing masses of hyaline or cartilaginous material further suggests the mesoblastic origin of these tumors. Ewing, on the other hand, maintains that the cells show no minute characters which permit their identification as endothelium. The long strands of cells resembling sprouting vessels may be produced by carcinoma, and, as Hinsberg pointed out, in many cases spines and fibrils may be demonstrated connecting the cells. The structures identified as lymph-spaces may equally well represent lumina of gland alveoli. The mixed origin, that is, mesoblastic and epiblastic, probably accounts for certain of these tumors in which the almost purely cartilaginous or the purely carcinomatous element predominates. Some of these tumors belong to the class of basal-celled carcinomas (adenoid cystic epitheliomas), as Krompecher has pointed out. Others probably are derived from the ducts and acini of the salivary glands.

It seems to me that no single theory will explain all of the mixed tumors. Some are distinctly adenomatous and probably arise from the tubules or ducts of the gland. Some of the encapsulated tumors arise from inclusion or embryonal rests, as branchial cleft remnants are common in this location. Whether any of them are of endothelial origin is very difficult to say, although the preponderance of evidence is against it, in spite of the fact that they behave very much like endotheliomas found elsewhere. Ewing has apparently proved that many of them are of epithelial origin, although to concede this makes it necessary to believe that cartilage can be derived from epithelium.

Occasionally other tumors, such as hemangiomas and lymphangiomas, are observed in the parotid. They are usually congenital and do not appear to be related to the mixed tumors.

Microscopically, the character of these parotid neoplasms varies enormously in different parts of the same tumor. This often causes very misleading reports. For example, the sections from one of the cases observed during the last few years appeared to be quite benign. However, recurrence after removal was quite prompt and the patient died later of carcinomatous cachexia. A careful study should be made of various parts of the tumor after it has been removed before making a definite prognosis. Even then we are apt to be misled, as some of the cases which are definitely carcinomatous do not occur for a long time, and seem to be held in check very well by x-ray therapy. As a precaution, in all cases I think x-ray should be advised. It will cause an atrophy of the glandular tissue, but this is of little consequence.

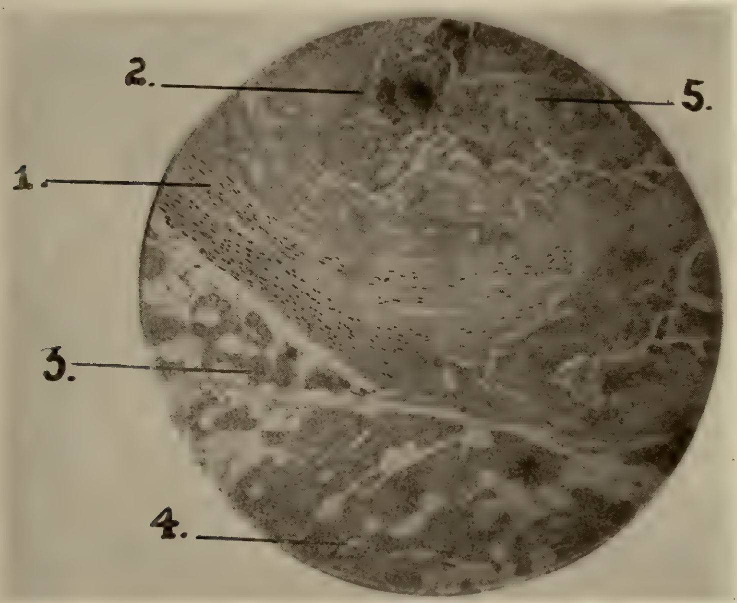

Fig. 418.—Microphotograph (low power) of mixed tumor of the parotid: 1, Connective-tissue capsule of tumor. 2, Tumor showing masses of cells resembling sarcoma under low power. 3, Normal parotid gland acini. A small portion of gland was attached to capsule of tumor. 4, Salivary duct. 5, Homogeneous (mucoid) material separated by cords of tumor-cells.

In a typical case there are strands of cells separating more or less homogeneous mucoid or cartilaginous material. These cells may take the shape of tubules, or may be in masses, so packed as to look like a sarcoma. Pearls and intercellular bridges have been demonstrated in many cases, proving beyond question the epithelial origin of parts of the tumor. Sometimes the tumor is enveloped by a connective-tissue capsule; again it may be intimately mixed with normal parotid tissue.

In conclusion, we have removed in its entirety an encapsulated tumor of the parotid gland without injury to the facial nerve. From the history, the incidence of such tumors, and the gross section it seems fair to conclude that we are dealing with a mixed tumor of the parotid gland which probably will not recur. We will have numerous sections made for microscopic study.

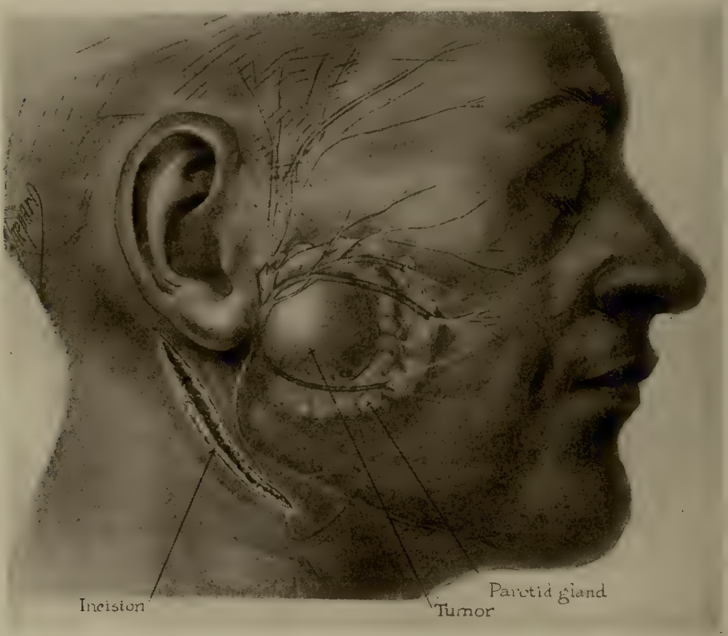

Fig. 419.—Schematic representation of tumor in relation to facial nerve. The parotid gland is shown pushed forward by tumor.

Postoperative Note (Three Months Later).—The patient has made a complete recovery from his operation and has no evidence of recurrence to date. Sections of the tumor are fairly uniform in structure. They consist of strands of cells, some of which are distinctly glandular, with tubule or alveolar formation; others are in compact arrangement resembling connective-tissue cells or, better, a spindle-celled sarcoma. There is no cartilage in any of the sections I have examined, although there is much mucoid tissue in some places, giving parts of the tumor the appearance of a myxoma. The nuclei of the cells are ovoid, well defined, and are surrounded by a variable amount of cytoplasm. The cell walls are very distinct in most places. No pearl formation is noted, although squamous cells are found in many places. There are spaces lined with cuboidal cells in which erythrocytes are seen. These may equally well be new blood-vessels lined with endothelium or tumor spaces with hemorrhage. There is no question about the diagnosis and treatment in this case. You are entitled to your own opinion as to the derivation of the cells of the tumor, although it seems to me they are distinctly epithelial.

CLINIC OF DR. ALBERT E. HALSTEAD

St. Luke's Hospital

(Reported by Dr. Frederick Christopher)

FOUR CASES REQUIRING LIVER SURGERY

CASE I. GUNSHOT WOUND OF THE LIVER

Patient, Edward Egan, aged twenty-six, St. Luke's Hospital, No. 160,981, was admitted to the Surgical Service of Dr. Albert E. Halstead on September 16, 1922. Immediately preceding his admission the patient was held up by three colored men and shot. The muzzle of the gun was held near the victim's body. On admission to the hospital it was noted that the wound of entry was in the right upper abdomen at the costosternal angle and that there was no wound of exit. The abdomen had a board-like rigidity and was somewhat tender. The patient complained of pain in the abdomen and in the right chest and shoulder, no dulness in the flanks. The pain in the chest was a sharp one and was occasioned by breathing. No evidence of cord injury.

The patient was admitted at 3 A. M., with a pulse of 72, which became steadily more rapid, until it was 104 at 6.30 A. M. There was shortness of breath and thirst. The patient's condition was serious, and at 7.10 A. M. operation was done by Dr. Halstead.

The abdomen was explored through an upper midline incision, and it was found that the bullet had entered the anterior surface of the liver, and after passing completely through that organ, had lodged in the tissues posterior to it (Fig. 420). The bullet wound of the liver, from which there was a profuse hemorrhage, was packed with sewed gauze, no attempt was made to remove the bullet. Some of the blood in the abdominal cavity was sponged out and the wound closed with drainage.

The postoperative course was rapid and favorable. The packing was removed a little at a time until it was entirely out on the sixth day postoperative. On October 18, 1922, twenty-nine days after the operation, the patient was discharged from the hospital, having been up and around several days and his wound completely healed.

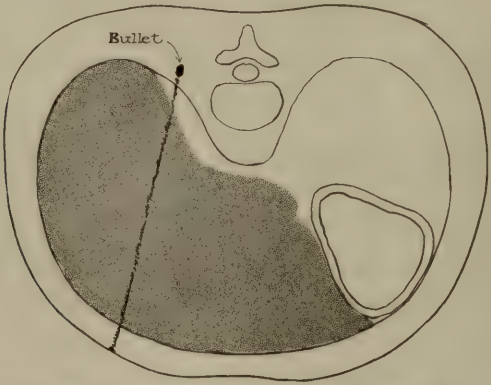

Fig. 420.—Diagrammatic cross-section of liver showing path of bullet. Case I.

CASE II. ECHINOCOCCUS CYST OF THE LIVER

Patient, Aleck Citsidis, aged twenty-seven, St. Luke's Hospital, No. 99,464, was admitted to the Surgical Service of Dr. Albert Halstead on May 8, 1922. The patient was a Greek, who had been in the United States for the preceding seven years. Ten years previous to the admission he had undergone an operation in the old country for "abscess of the liver," and was confined to the hospital three or four weeks at that time. Up to a year and a half before admission the patient felt very well, but since that time there has been some pain and slight swelling in the upper right quadrant. This difficulty was not sufficient to confine him to bed. Four days previous to admission an opening appeared in the old scar and a pint or more of watery fluid escaped. The patient thought that some 2 quarts of fluid had escaped from the sinus in the four days preceding admission. The history is otherwise negative, save that the patient always had four or more dogs and was very fond of them; he used to even take one of them to bed with him. Patient was a shepherd in Greece as a boy, and secured nourishment by sucking female sheep.

The physical examination was negative save for a discharging sinus in the upper right quadrant of the abdomen, from which was obtained characteristic hooklets in several small echinococcus cysts.

Urine showed albumin and a few granular casts. Blood examination: Erythrocytes 4,540,000, leukocytes 11,900, hemoglobin 74 per cent. (Sahli); differential count: small lymphocytes 30 per cent., large lymphocytes 4 per cent., polymorphonuclear neutrophils 65 per cent., polymorphonuclear eosinophils 1 per cent.

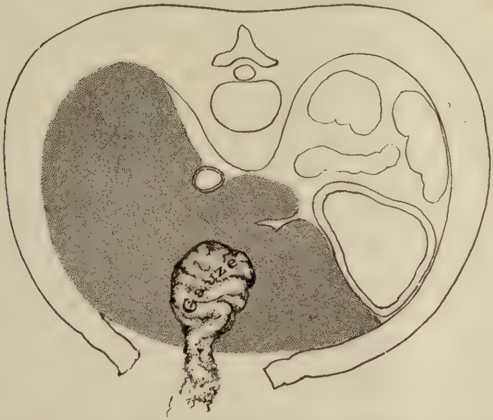

Fig. 421.—Diagrammatic cross-section of liver showing method of packing cavity in liver after removal of echinococcus cyst. Case II.

Operation May 19, 1916, Dr. Albert E. Halstead. Gas induction and ether anesthetic. An incision 4 inches long was made along the lower border of the rectus on the right side. The cyst cavity was opened and drained. It was then dried out as well as possible and cauterized with strong hydrochloric acid and the cavity packed with iodoform gauze (Fig. 421). The wound was closed at the lower angle with silkworm sutures.

After operation dressings were done daily, and the cavity, which was lined with a granulating surface, became steadily smaller. The patient was discharged on July 18, 1916, two months after admission, with the wound practically healed. The wound healed shortly afterward and the patient has been cured ever since. He was a soldier in the World War.

CASE III. ABSCESS OF THE LIVER FOLLOWING APPENDICITIS

Patient, Norman Robinson, aged thirty-two, St. Luke's Hospital, No. 156,508. Admitted to the Medical Service of Dr. Joseph A. Capps on March 22, 1922. The patient has always been in fair health save for an indefinite gastric distress coming on after meals. Three weeks previous to admission following a transient attack of nausea in the evening he was seized with violent abdominal pains at 5.30 in the morning. The abdomen was rigid and tender. A few hours later he was operated upon, and the abdomen was found to contain a great deal of pus. The appendix, which apparently was the cause of the trouble, was removed and the wound was closed with drainage.

The convalescence was uneventful save for a "patchy sore throat," with fever a week after the operation, and which lasted for a few days. The abdominal incision healed quickly and the patient was home twelve days after the operation. Since going home the patient felt much worse, and for the week preceding admission to St. Luke's has had tenderness in the upper abdomen, especially in the epigastrium and the left upper quadrant. For the last eight days there has developed a tender spot on the left trapezius ridge. There was also a sharp "catching" pain in the left breast, which with the pain in the shoulder causes the patient to jerk the head back with each respiration. There is dyspnea, chills, and sweats. The fever goes as high as 104° F., the curve having sharp ascents and descents. There appeared to be a slight bulging in the epigastrium. In the right upper quadrant there is some rigidity and marked tenderness. The leukocyte count was 12,000, the erythrocytes 4,980,000, and the hemoglobin 95 per cent. The urine showed a trace of albumin with occasional hyaline and granular casts.

On March 23, 1922 Dr. Albert E. Halstead saw this patient in consultation with Dr. Capps. The diagnoses considered were a subdiaphragmatic abscess probably due to a recent perforated gastric ulcer or an abscess of the liver.

Operation by Dr. Halstead, March 24, 1922. On opening the abdomen through a midline incision adhesions were found bringing the stomach to the liver. The abdominal cavity contained a bloody, serous fluid. The liver itself was very much enlarged and was covered with a fibrinous exudate. The falciform ligament was pushed to the right side. In the anterior part of the left lobe near the midline a soft spot was found. This position was explored, and from a depth of 1½ inches below the surface of the liver pus was aspirated. There was no collection of pus or fluid in the lesser peritoneal cavity. The abscess was not incised, but packing was so inserted as to separate the liver from the abdominal cavity. The wound was only partly closed and in such a manner that the soft area in the liver presented to the exterior. Packing was placed around the wound edges. The abscess was left unopened at this time, as it was hoped that in a few days adhesions would form between the parietal peritoneum of the abdominal wall and the visceral peritoneum of the liver in such a manner as to completely wall

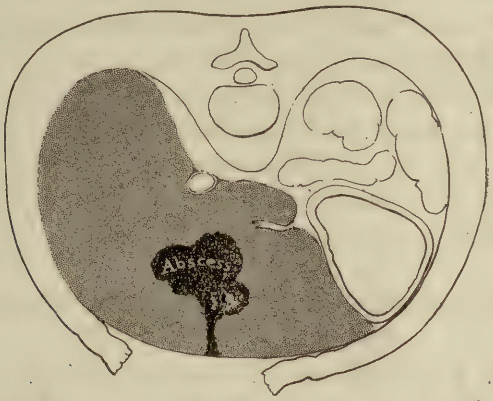

Fig. 422.—Diagrammatic cross-section of liver showing situation of abscess cavity mentioned in Case III.

off the affected portion of the liver from the abdominal cavity. Cultures obtained from the liver pus showed streptococci which did not change the blood.

Three days after the operation a blunt needle was inserted into the previously made opening in the liver and ½ ounce of pus was allowed to escape. The patient's condition had improved steadily since the operation and there had been no chills since then. From that time on the sinus to the liver abscess was kept opened and drainage was encouraged (Fig. 422). On the twenty-ninth day postoperative the wound was closed by suture save for an opening at the upper end of the wound for drainage. On the thirty-third day postoperative the patient was up and about and the wound was cleanly granulating. The patient was discharged for further care by his family physician on the thirty-seventh day after the operation. At that time his general condition was very good, his temperature was normal, his liver was small and scarcely palpable below the costal margin. The wound was granulating in rapidly. From latest reports the patient is in excellent health.

CASE IV. MELANOSARCOMA OF LIVER SECONDARY TO MELANOMA OF THE CHORIOID

Patient, Claus Brink, St. Luke's Hospital, No. 152,873. He was admitted to the Surgical Service of Dr. Albert E. Halstead in 1910. At this time the patient was nearly blind owing to choked disk. A diagnosis of cerebellar tumor was verified in the two-step operation by which the tumor was removed. The patient made a complete recovery.

In 1918 the patient began to notice impairment of vision in the right eye. In 1919 he was subjected to an operation for cholelithiasis elsewhere than St. Luke's by another surgeon. At this time a brownish tumor mass was found in the liver, and some procedure was done which required packing the liver.

On October 4, 1921 the patient was readmitted to the Surgical Service of Dr. Halstead. Examination of eye by Dr. Frank Brawley showed: "Right eye, exophthalmos downward and forward. Fundus shows papillitis of 1½ D. height. Left eye shows slight papillitis with a filled-up physiologic cup."

The patient complained of a diplopia, deafness, and feeling of fulness in the head. Beneath the scar of a recent operative wound in the right upper quadrant is a firm, smooth mass of considerable size. A diagnosis of tumor of the liver, possibly a cystic tumor, was made.

Operation by Dr. Halstead October 7, 1921. After dissecting through numerous adhesions the gall-bladder was seen; it was hard and distended. On cutting it open a peculiar putty-like bile was scooped out. The gall-bladder was removed. The liver in the neighborhood of the gall-bladder was replaced by a dark colored grumous material. This was thoroughly cleaned out and the opening in the liver was packed. The dark colored, putty-like material was examined by the pathologist and found to be a melanosarcoma, and in it were cotton threads doubtless the remnants of packing at the previous operation. There were also crystals which looked like cholesterol, and green and yellow blood pigments. The patient's postoperative course was satisfactory. The packing was gradually removed, and on the thirty-first day postoperative the patient was discharged.

The patient was readmitted to the hospital on November 29, 1921 for the purpose of having a decompression in the hope of relieving the symptoms attributable to increased intracranial pressure. As little improvement was to be hoped for, however, the operation was not done. In December, 1922 the patient was still alive and in fair health.

The most probable explanation of the pathology in this case seems to be that entirely independently of the cranial neoplasm removed in 1910 the patient developed a primary melanosarcoma in the chorioid of the right eye which later gave metastases to the liver. The curious feature of the case is the extraordinary length of time of life which patient has enjoyed since the first appearance of the malignant tumor.

DISCUSSION

The liver may be injured either subcutaneously or through a wound. For practical purposes wounds of the liver may be divided into gunshot wounds and stab wounds, with the former nearly twice as common as the latter. The right lobe is injured six times as frequently as the left.[1] Of penetrating abdominal wounds 16 per cent. involve the liver, 7 per cent. the kidney, 2.7 per cent. the spleen, and 0.4 per cent. the pancreas.[2] In 1887 Edler[2] found the mortality from gunshot wounds of the liver to be 39 per cent. Terner and Ouvray report 14 cases of gunshot wounds of the liver, with 4 deaths. The most recent statistics are those of Tilton,[3] who in ten years at New York hospitals found the mortality of gunshot wounds of the liver which were operated upon to be 28.5 per cent. Gunshot wounds of the liver are found many times to be associated with perforating wounds of the diaphragm, liver, stomach or intestines, and kidney. The chief factors in the diagnosis are: (1) The situation of the wound of entry; (2) the symptoms of internal hemorrhage and of shock. Finsterer[4] noted a bradycardia in 12 out of 13 liver ruptures and 2 gunshot wounds of the liver, and believes it to be a constant and characteristic sign of liver injury.

In all cases where there is even a possibility of a gunshot wound of the liver immediate operation is imperative. It is important to examine the entire liver, as wounds of exit are not infrequently found in unsuspected locations. The purpose of the operation is to control hemorrhage, and experience has shown that gauze packing is the best for this purpose. Halstead[5] on one occasion drew the omentum through the hole made by the bullet in the liver and effectually stopped the hemorrhage. Should suture of the liver be thought advisable, a blunt supple needle and thick suture material should be used. The thermocautery has been found to be of very little value in arresting hemorrhage from the liver.

The terms "hydatid" and "echinococcus cyst" are used interchangeably. Both are derived from the Greek, the former meaning a vesicle of water, and the latter, hedgehog and berry. The origin of the echinococcus cyst is from the dog tapeworm, the Tænia echinococcus. If man ingests the eggs of this parasite, they are liberated in his stomach. The embryos penetrate the intestinal wall and reach the liver or other organs. There the larval stage is developed and a cyst begins to form. More commonly the cyst is unilocular, the multilocular cysts being more rare. The disease occurs in this country, but is more prevalent in Europe. Over half the cases are between the ages of twenty and forty. In Iceland, Silesia, Australia, and Province of Manitoba in Canada the disease is very prevalent. The patients invariably give a history of association with dogs. Although an echinococcus cyst may arise in almost any organ of the body, a comparison of statistical tables shows that these cysts occur more frequently in the liver than in all other parts of the body together.[6] The liver is doubtless most affected because it is the main depot of absorption from the intestinal tract via the portal vein. The cysts may reach enormous size.[7] In one case a liver thoroughly infested with cysts weighed 25 pounds.[6]

Echinococcus cysts of the liver are painless, grow with moderate rapidity, are dull on percussion, fluctuate if near enough the surface, and occasionally give the peculiar hydatid fremitus which is a curious vibratory thrill obtained by percussing the middle finger of the left hand when it is firmly laid over the tumor. Pneumoperitoneum with *x*-ray has been recommended as a valuable aid in the diagnosis of echinococcus cyst.[8] If left unoperated the cyst may rupture spontaneously and take various directions; it may burst into the abdomen, or into the pleura or lung, and the vesicles escape through the bronchial tubes and trachea. Rarely it may burst into the pericardium, the stomach, the intestines, or rarely into the gall-bladder, and still more rarely into the vena cava, when the contents will be carried as emboli into the right cavities of the heart. When the fluid escapes into the abdomen it sets up an urticaria which itches intensely.

The treatment of echinococcus cysts of the liver is always surgical. The operations may be divided into: (1) incision and drainage, and (2) incision and enucleation of the sac. The latter is the much more complete operation.[9] The wound surfaces should be carefully protected from the hydatid fluid, as it has been shown beyond question that hydatid infection of these raw surfaces may occur.[10] Destruction of the living organisms in the cyst wall by antiseptic solutions of formalin or corrosive sublimate previous to enucleation of the parent cyst has been recommended. "Marsupialization" is the term applied to the procedure in which the incision in the liver is carefully united to the peritoneum with catgut sutures. Tapping of echinococcus cysts is an uncertain and a highly dangerous procedure.[11]

The causes of single liver abscess have been enumerated by Pannett[12] as follows: (1) Amebic dysentery, which is by far the commonest; (2) trauma, which is next most frequent; (3) extension of a cholecystitis to liver directly is most unusual, as is also (4) abscess due to a perforation of a simple or malignant ulcer of the stomach, (5) very rarely after typhoid fever; (6) hydatid cyst of the liver sometimes becomes infected and forms an abscess; (7) lastly, and most rarely, some septic focus in the abdomen leads to a portal vein infection of the liver and single liver abscess. The cause may be a gastric ulcer, appendicitis, or even a septic stump left after an operation for piles.

The incidence of liver abscess following appendicitis is probably not as rare as Pannett has indicated. Bruggeman[13] collected some 28 cases of liver abscess as a complication to appendicitis in which there had been an operation and recovery. In a previous clinic[14] the writers carefully reviewed the rather extensive literature on pylephlebitis and liver abscesses as sequelæ of appendicitis. The anatomic relationship of the appendix to the liver is very significant. The appendical veins empty into the ileocolic vein, the latter into the right colic vein, and that into the superior mesenteric vein, which, in turn, empties into the portal vein. Infection is propagated toward the liver by either the continued thrombosis or septic emboli. Monro emphasized that the retroperitoneal lymphatics afford another route between the appendix and the liver.

Localized hepatic abscess should be evacuated by incision at the earliest possible moment. Three routes are possible for effective entrance into the abscess cavity[15]: (1) abdominal incision; (2) transpleural incision; (3) combined abdominal and transpleural incision. It is interesting to note that when large areas of the liver are destroyed by acute infection the remainder will hypertrophy until the original weight is nearly restored.[15]

Melanoma is a pigmentiferous tumor arising from a specific mesoblastic cell, the chromatophore, and possibly also from epithelial cells which have been modified by pigment production. It arises chiefly in the skin and the choroid coat of the eye, less frequently in the meninges, rectum, and other organs. The term "melanoma" should be employed to emphasize the specific character of the tumor and its cells of origin. The possible origin from epidermal cells may be indicated by the term "melanocarcinoma," and the sarcomatous character of other tumors is indicated as melanosarcoma.[16] Malignant melanoma develops in a small proportion of cases, usually after trauma or incomplete extirpation. About one-third of all melanomas originate in the choroid. The congenital nevus is the starting-point of those originating from the skin. Primary melanoma of the liver is a very difficult diagnosis to establish.[16] Rolleston,[17] in referring to 9 reported cases, points out that no case can be accepted unless the uveal tract has been examined after death. This precaution has usually been omitted. In 2 cases very small uveal melanomas were discovered only at autopsy.

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CLINIC OF DR. HERMAN L. KRETSCHMER

PRESBYTERIAN HOSPITAL

PYELOGRAPHY

Pyelography One of the Most Valuable Diagnostic Aids in Urology. Historic Review. Solutions Used. Technic. Dangers—to the Kidney Itself; to the Patient. Congenital Anomalies Demonstrable by Pyelography. Other Urologic Conditions in Which Pyelography is of Value.

ONE of the most valuable diagnostic aids in urology is pyelography, and when first introduced it was most frequently employed in urologic diagnosis only, but in more recent years it has come to enjoy a very wide range of usefulness in general abdominal diagnosis. The problems of differential diagnosis of lesions of the right upper as well as the right lower quadrant are familiar to all, especially in cases giving an atypical history. This type of case was often subjected to one or more exploratory operations, many times without benefit to the patient. In the differential diagnosis of the various possible lesions pyelography plays a most important rôle, and one of the very striking features of pyelography is the fact that it reached this firm niche in our diagnostic armamentarium in but a few years. Although at first it met with much strenuous opposition, and still does, one is justified in stating that, with but few exceptions, there have been few diagnostic procedures whose accuracy and value is now so generally recognized.

Historic.—The first pyelograms were made by Klose in 1904 in a case of complete double ureter. He injected a suspension of bismuth into the pelvis of the kidney and ureter combined with radiography. It was at once apparent that bismuth suspension was an unsuitable media for this purpose because of the danger of leaving particles of bismuth within the kidney pelvis and along the ureter.

Several years later Voelcker and Lichtenberg successfully demonstrated the outline of the kidney pelvis and ureter by means of colloidal silver, using collargol. They attempted to outline the bladder in roentgenograms. They observed that the fluid placed in the bladder for this purpose had found its way up the ureter and kidney pelvis so that they were outlined in the roentgenogram. Following up their observations, they then injected the solution directly into the renal pelvis through the ureteral catheter. Stimulated by their results they were able to report a series of cases of successful pyelograms.

Although Klose was the first to carry out pyelography, Voelcker and Lichtenberg's work resulted in stimulating others to follow in their footsteps. Although at first their work received but little attention, the importance and value of this measure is now universally appreciated and recognized.

One of the first to appreciate the importance and value of this procedure was Braasch. With the enormous amount of material at his disposal and confronted with problems of differential diagnosis between lesions of the kidney and ureter and lesions of various abdominal organs, he was soon in a position of having done more pyelograms than any man in this country, if not the entire world. His publications deal with all phases of this subject, and his monograph is a most important contribution to the subject.

Solutions Used.—Various chemicals have been used for this purpose. As just stated, Klose used bismuth, which had the great objection of leaving the pelvis and kidney coated. Solutions of colloidal silver were used by Voelcker and Lichtenberg. They used a 5 per cent. solution of collargol. This was really a suspension, and had many objections, so that its use was soon discontinued for "solutions" of the newer silver salts, such as argyrol, cargentos, and nargol. These solutions, for various reasons, were unsatisfactory, and Uhle and Pfahler advised the use of an emulsion of silver iodid. Kelly and Lewis also advised its use. There was still a good deal of dissatisfaction with these solutions, and Burns advised using a 10 per cent. solution of thorium nitrate which was a clear, colorless solution, hence more easily handled, much cleaner, and because of its high atomic weight the resulting pyelograms were of much better quality than those obtained with the earlier drugs used. Thorium, however, was expensive and difficult to obtain during the war. These were its chief objections. Minor objections were that severe reactions following its use still occurred.

The use of sodium iodid and sodium bromid, as well as the bromid and iodid of potash, were advised later. At the present time I believe most of the men are using one of the latter group of drugs. For the past three years we have been using a 15 per cent. solution of sodium bromid, with most gratifying results. This solution is easy to prepare, is not destroyed by sterilization, is not expensive, is clean, and in my experience produces fewer reactions than any of the previously mentioned agents.

The use of oxygen for purposes of pyelography was first suggested by Burkhardt and Polano, and later Lichtenberg and Dieken reported a series of cases in which they had injected oxygen instead of colloidal silver. This method never found favor and was soon discontinued.

Technic.—In general, two methods of injection are used: (1) By means of a hand syringe; (2) by means of a buret.

Probably the largest number of men use a glass syringe, such as a Luer, connect this with the ureteral catheter, and make the injection. Needless to say, great care must be used when the syringe is employed, as too great pressure may be dangerous. Because so many reactions, some very serious, followed injections made with the hand syringe, various observers advised the use of an ordinary laboratory buret; that is, the gravity method. The container should be placed only a very short distance above the level of the patient. It would appear that this is a safer method of making the injection, especially for the inexperienced.

Very often the mistake is made of injecting the solution too rapidly. This results in a rapid overdistention of the renal pelvis, with severe renal colic, and often nausea and vomiting. It cannot be emphasized too often or too forcefully that the solution must be injected very slowly. In obtaining a pyelogram, it is desirable to have the pelvis full, but one should avoid overdistending the pelvis. The solution should be injected just to the point of fulness or discomfort in the region of the kidney, but one should stop short of the production of pain.

Dangers.—Pyelography is not free from danger, nor is this a fool-proof method, or is it one to be carried out just to be "doing something" for the patient. These dangers may be discussed under the dangers to the kidney and the dangers to the patient.

The dangers to the kidney itself probably are not as great today as they were prior to the use of sodium bromid or iodid. The real dangers were present in the days when the colloidal silver was used, although one must again add that in a large measure the bad results were probably due to *errors in the technic.*

In some of the kidneys that were removed following pyelography deposits of silver were found in the parenchyma of the kidney, with resulting destruction or necrosis of kidney tissue. Deposits of collargol have been found in the malpighian bodies and between the tubules.

In 2 cases in which the kidneys were removed following pyelograms made elsewhere I have seen the presence of very large wedge-shaped infarcts; cases have been reported in which the colloidal silver was found outside of the kidney, that is, in the perirenal fat.

Dangers to the Patient.—Certain reactions may result from pyelography, the most frequent being pain. This may at times be so severe as to require repeated hypodermic injections of morphin. The pain is generally referred to the renal area. It is not rare to see this severe pain persist from twelve to twenty-four hours, so that the patient is forced to stay in bed. Reflex nausea and vomiting may occur, but they are rare. As stated previously, it is my impression that the complications of pyelography may often be the result of too rapidly injecting the solution into the kidney pelvis.

Chills and fever may follow the injection. This, I believe, is not due to the injection *per se*, but due to the fact that as a result of the injection an existing infection lights up. If it is possible to demonstrate particles of collargol in the renal parenchyma following injection, it is reasonable to assume that if infection is present in the pelvis, the micro-organisms present in the pelvis can be carried into the substance of the kidney, resulting in an acute pyelonephritis. This, I believe, is the real explanation of the chills and fever that sometimes follow pyelography.

Fatalities have been reported and should be borne in mind.

Severe jaundice following pyelography I have seen twice—once, appearing after injecting a very large hydronephrosis with thorium nitrate. The hydronephrosis was a very large one and was not recognized before the injection was made. The second followed the injection of a small hydronephrosis.

Anuria.—Suppression of urine has occurred after bilateral pyelography, and fatal cases are a matter of knowledge. Partly due to this serious complication some urologists never do a double pyelogram.

In order to prevent some of the untoward results of pyelography various men have advocated the use of small ureteral catheters, so that when the pelvis is fully distended the excess of fluid will flow down the ureter alongside the catheter. This, in my hands, has been a most helpful addition to the technic.

Not only should one avoid overdistention of the pelvis, but one should inject the fluid slowly, since rapid distention is more apt to be followed by both the local and general reaction.

Pyelography is a very valuable diagnostic aid in renal and ureteral surgery, and the complications and dangers should always be borne in mind. When carefully carried out the danger can be reduced to a minimum. It is not uncommon to have patients react after an ordinary cystoscopy and ureteral catheterization without pyelograms, so that one must differentiate between the reaction due to instrumentation and that due to pyelography.

The Normal Pyelogram.—The size of the normal pelvis is variable. The average has been variously stated as being from 5 to 9 c.c. Some authors consider a pelvis that is capable of holding 15 c.c. still within normal limits. In our work we regard as normal limits from 5 to 9 c.c.

The normal pelvis is generally found between the bodies of the first and second lumbar vertebræ. The outline of the normal pelvis shows a great many variations.

The normal pelvis is made up of the true pelvis, the major calices, and the minor calices.

The true pelvis is generally more or less pyramidal in outline and consists of a mesial and lateral border. The major calices are generally three in number, although one may find but two major calices, and again there may be more than three.

The minor calices extend a short distance beyond the major calices.

Congenital Anomalies.—As is well known, the kidneys and ureters are subject to various congenital anomalies. Formerly these anomalies were reported from the postmortem room since there were no accurate means for demonstrating them clinically, unless these patients were operated upon and the organs studied at the time of operation or afterward. Since the advent of pyelography these anomalies are being recognized more frequently, and it is really surprising to see the number of such cases one meets with in the course of a year's work.

The first pyelogram I wish to show is one that was made for purposes of differential diagnosis. A woman of twenty-four complained of attacks of renal colic associated with frequency of urination. A pyelogram was made, and this showed the presence of two pelves on one side. The lower pelvis is apparently normal in size and general contour, except that it is low, being opposite the third lumbar vertebra. The upper pelvis is situated high, as one would expect, being opposite the transverse process of the first lumbar. Cultures of this patient's urine showed colon bacilli (Fig. 423).

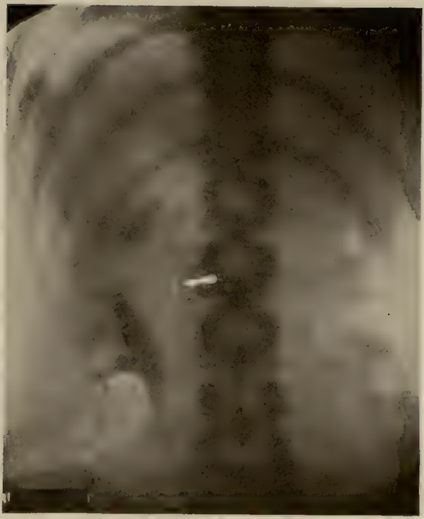

Fig. 423.—Shows the presence of a double pelvis.

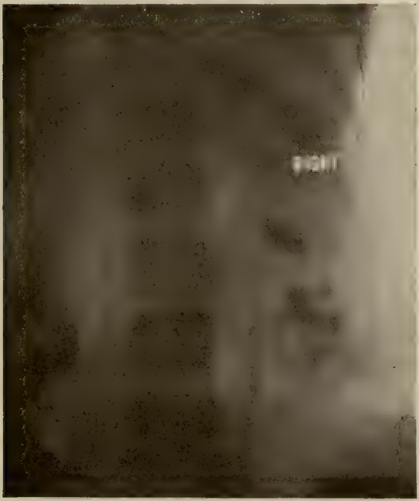

Fig. 424.—Double pelvis.

Another case is that of a young man who came in with pus and colon bacilli in his urine and a history compatible with acute infection in the genito-urinary tract. Cultures of his urine showed colon bacilli and microscopic examination of his urine showed pus. Shadowgraph catheters were passed and pyelograms were made. Cystoscopy showed the bladder to be normal and the ureteral orifices in normal position. Examination of the pyelogram shows that the right catheter passes out rather further than normal. The left catheter passes upward, and when it reaches a point opposite the pelvic brim it turns sharply to the right. Pyelogram of the right side shows the pelvis of the kidney to be dilated and situated just above the crest of the ilium. The "left" side shows the "left" pelvis in the "right" iliac fossa near the median line. The patient, therefore, has a unilateral or solitary kidney; that is, he has his mass of renal tissue on the right side and no kidney tissue on the left side. This case will be reported in detail elsewhere.

These cases, of course, are very rare, and the cases reported in the older literature are all, or nearly all, autopsy specimens. Pyelography combined with shadowgraph catheters is an extremely valuable aid in the recognition of this anomaly.

Hydronephrosis.—The value of pyelography in the diagnosis of early hydronephrosis can hardly be overemphasized. In cases of large hydronephroses in which the hydronephrotic sac is distended with urine the problem of diagnosis is relatively easy. As a matter of fact, we rarely make pyelograms in cases of large hydronephroses if we can recognize the hydronephrosis without this aid. Our reason for this is based on the fact that these large hydronephrotic sacs do not empty themselves and they retain the media used which results in rather severe reactions as well as resulting in much pain in the kidney. This was particularly true in the early days of this work when various colloidal silver salts and thorium were used. Since using sodium bromid solution our reactions, in general, as well as in large hydronephroses, are less severe and less frequent. In spite of the previously mentioned rule we occasionally do inject a large hydronephrosis which for some reason or other was not recognized before pyelograms were made, and in these we believe we are having less reactions with sodium bromid than with other solutions. This, however, does not justify our deviating from the rule not to inject large hydronephroses.

The first pyelogram of a hydronephrosis that I wish to show is that of a woman who was referred to me because of pain in the back and pus in the urine. Examination of the pyelogram shows a small hydronephrosis, the pelvis being low; that is, opposite the third lumbar vertebra. The interesting feature of this pyelogram is the fact that the mesial margin is rather sharp. Careful inspection of the pyelogram shows the inner part of the pyelogram rests against the psoas muscle which happens to be very easily visible. I have repeatedly noted this phenomenon, and believe that this type of picture is due wholly to contact with the psoas muscle (Figs. 425, 426).

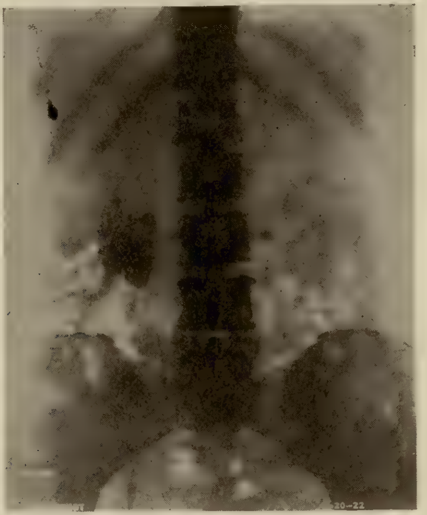

Fig. 425.—Pyelogram in contact with psoas muscle.

The next pyelogram that I wish to show is one of a patient who had pus and colon bacilli in the urine, and in plain x-rays a small group of shadows just above the crest of the ilium was noted. This pyelogram (Fig. 427) shows a rather extensive hydronephrosis and the shadows are almost obliterated by the sodium bromid solution. It is clearly evident, therefore, that these shadows are in an enlarged and dilated kidney. The ureter also shows a great deal of dilatation.

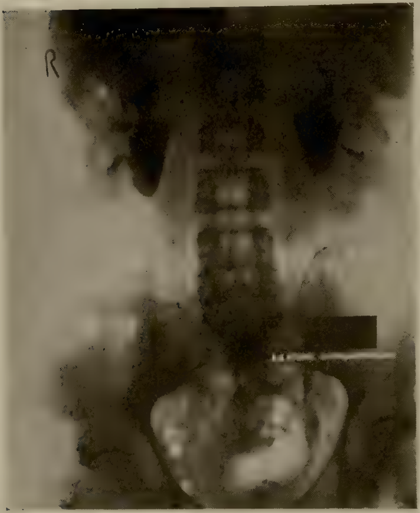

Fig. 426.—Both pyelograms in contact with psoas muscle.

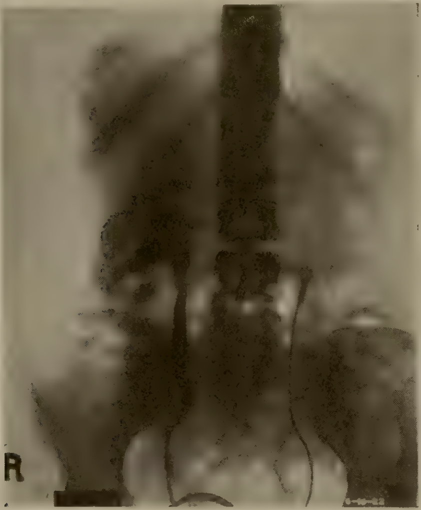

Fig. 427.—Hydronephrosis. Dilatation of ureter. Kidney stones.

The next pyelogram (Fig. 428) shows a very small hydronephrosis due to pelvic disease. The patient had a very bad retroversion, an endometritis as well as very profuse and painful menstruation. At various times blood had been found in the urine, and the problem for differential diagnosis was to determine whether her backache was due to her gynecologic disease or whether she had an independent lesion in her right kidney which caused blood in the urine, pains, and backache. Examination of the pyelogram shows a small hydronephrosis.

The next pyelogram that I wish to show is one of a hydronephrosis due to an aberrant renal artery (Fig. 429).

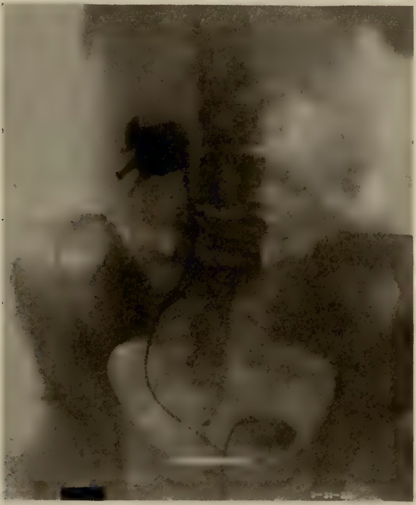

Fig. 428.—Small hydronephrosis due to pelvic disease.

Several years ago a great deal of enthusiasm was manifested by writers who found the presence of aberrant arteries at the time of operation. In view of the fact that the artery crossed the ureter rather sharply, and that above the point of crossing the ureter or pelvis was dilated, led to the conclusion that this type of hydronephrosis was due to the presence of an aberrant artery. In other words, it was assumed that the aberrant artery was the cause of hydronephrosis. Recently these views have been questioned, and it has been argued that the aberrant artery does not produce the hydronephrosis, but as a result of the enlargement of the kidney or its pelvis the enlargement

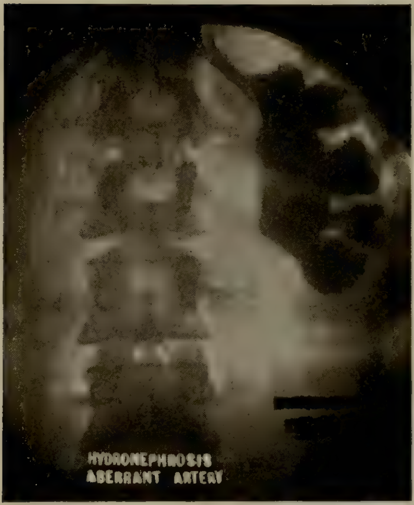

Fig. 429.

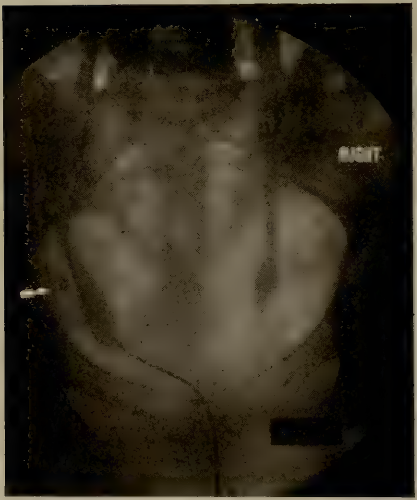

Fig. 430.—Hydro-ureters. Extra-ureteral shadow on left side.

impinges upon the artery, and the presence of the aberrant artery is incidental and has nothing to do with the production of the hydronephrosis (Fig. 429).

Often in making a pyelogram attempts are made to include the ureters, and when this is done, one very frequently is rewarded by the demonstration in the ureter of definite pathology.

The pyelogram that I am about to show you next is that of an elderly woman who had frequency, pain on urination, pain in the back, and hypertension. Plain *x*-rays showed the presence of a shadow in the bony pelvis because of which a provisional diagnosis of stone in the ureter was made. Shadowgraph catheters were passed, a ureterogram was made which showed the shadow under discussion as outside the ureter. Both ureters appeared enormously dilated (Fig. 430).

Tumors.—Nowhere in the entire realm of urologic diagnosis does pyelography play so important a rôle as it does in the diagnosis of tumors of the kidney. I refer particularly to the early diagnosis of renal tumor. When the tumors are large and can be diagnosed by palpation the prognosis is usually bad. Our problem, here as elsewhere, is that of early diagnosis. We feel that in the early recognition of renal neoplasms pyelography plays a most important rôle.

The first pyelogram shows definite changes in the superior calyx. The calyx has lost its shape and appears frayed out, as it were. From this pyelogram, coupled with the fact that the patient had bloody urine from this kidney, a diagnosis of hypernephroma was made, an immediate operation was performed, and the diagnosis verified (Fig. 431).

In contrast to this pyelogram, which shows its disturbance as located around one of the calices, I wish to present this pyelogram made to determine the origin of a large tumor in the abdomen. The presence of the tumor with a severe anemia led to a diagnosis of an inoperable hypernephroma. In order to verify the clinical diagnosis this pyelogram was made. In looking this over one sees the shadowgraph catheter stopping at a point opposite the brim of the pelvis. Passing inward from here to the transverse process of the second lumbar one obtains a rather sharp outline of the ureter. Beyond this point it is impossible to get any of the sodium bromid solution. In this instance the tumor has completely invaded the kidney pelvis,

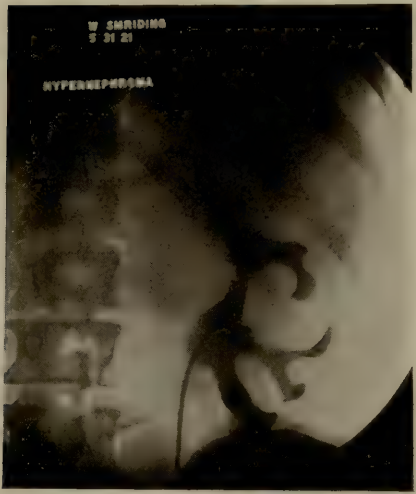

Fig. 431.—Hypernephroma.

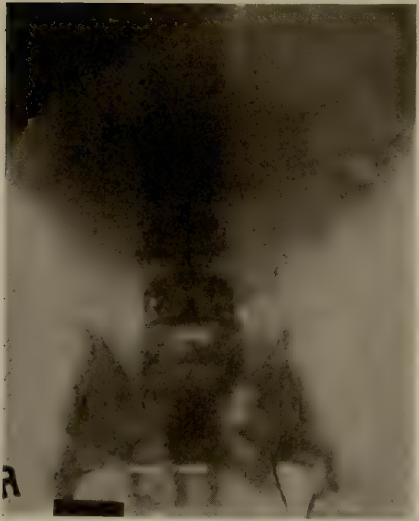

Fig. 432.—Hypernephroma.

so that no pelvic cavity remains, and hence no pyelogram, in the true sense of the word, can be obtained (Fig. 432).

In the diagnosis of tumors primary in the renal pelvis pyelography has given us most valuable information.

Renal Tuberculosis.—As a rule, pyelograms are not made in cases in which a diagnosis of renal tuberculosis can be made. In other words, if from the cystoscopic examination, ureteral catheterization, and bacteriologic examination of the urine a diagnosis of unilateral renal tuberculosis is established we do not carry out pyelography.

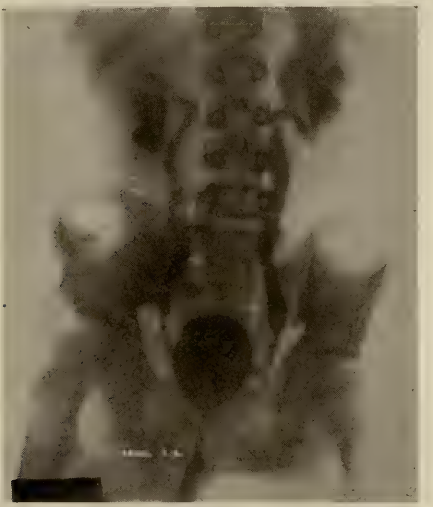

Fig. 433.—Bilateral renal tuberculosis.

There are circumstances, however, in which one feels that pyelography can be carried out, and we wish to show a few of these pyelograms.

The first pyelogram is that of a boy aged eleven, who had frequency, pus, and tubercle bacilli in the urine (Fig. 433). Cystoscopic examination showed a very severe tuberculosis of the bladder. Ureteral catheterization showed the presence of tubercle bacilli in the urine from the right side. The opening of the left ureter could not be found. It was decided, therefore, to do a cystogram, which shows the presence of a hydronephrosis on one side and changes in the inferior calyx on the opposite side. From this cystopyelogram a diagnosis of bilateral renal tuberculosis was made.

The next pyelogram was made before tubercle bacilli were isolated from the urine. The patient was a boy of fifteen who had unilateral pyuria. Tubercle bacilli could not be found in the urine, and it was decided to do a pyelogram which shows the presence of a stricture of the ureter and very definite changes in the superior, middle, and inferior calices (Fig. 434). Tubercle bacilli subsequently were found in the urine from the right kidney, and a nephrectomy performed, which substantiated the diagnosis.

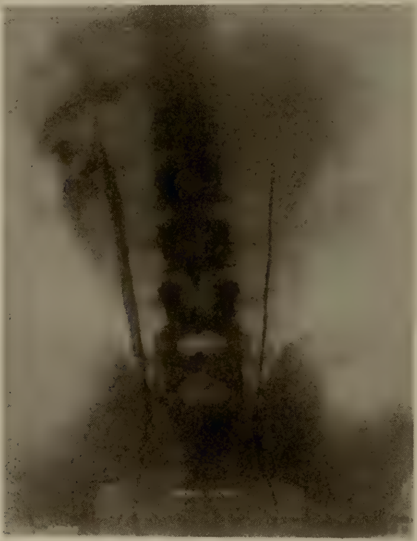

Fig. 434.—Unilateral renal tuberculosis.

Renal Calculi.—In the ordinary routine of our work we do not make pyelograms in cases of stone in the kidney or stone in the ureter unless this be for some special reason. For example, if the patient has a shadow that lies in an area apparently outside of the normal kidney area and one wishes to determine the origin of this shadow-producing body, one is then justified in making a pyelogram. I do not refer to this group of cases.

What I refer to is the usual case of stone in the kidney, and in the pelvis of the kidney, in which, from the Roentgen-ray plates, one is justified in making a diagnosis of stone in the kidney.

Pyelography is of value in bringing out certain stone shadows that do not show up well in the roentgenogram, and as an example of this I should like to show the following pyelogram (Fig. 435).

The patient complained for many years of pain in the back and occasionally she noticed her urine was bloody. A plain x-ray was made, and showed the presence of a faint shadow opposite the transverse process of the fourth lumbar vertebra. The shadow was discerned only after very careful plate reading. The question of the location of this shadow was discussed, and it was decided to do a pyelogram, which proved to be very interesting. The shadow was shown to be in the inferior calyx, and it is recognized by the fact that this part of the pelvis is lighter than the rest of the pelvis.

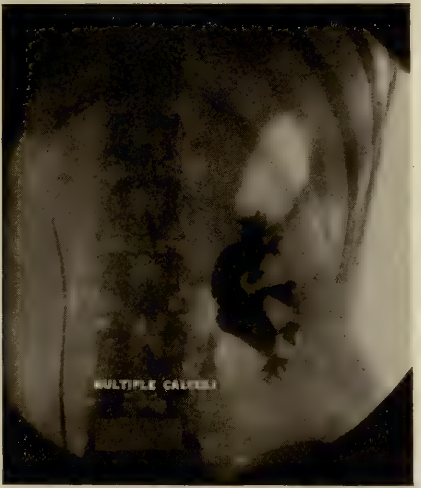

Fig. 435.—Calculus in inferior calyx.

This procedure, that of bringing out kidney stone shadows which do not show very well in plain plate, was reported by

Graves of Boston a short time ago, and is the opposite of the procedure advised by Kummel many years ago, that of injecting into the kidney pelvis a solution of collargol in order to increase the density of the stone.

Polycystic Disease of the Kidney.—This disease of the kidney, as usually met with, is not difficult of recognition because of the presence of enlargement of both kidneys. However, occasionally one might be justified in performing a pyelogram to differentiate various lesions (Fig. 436).

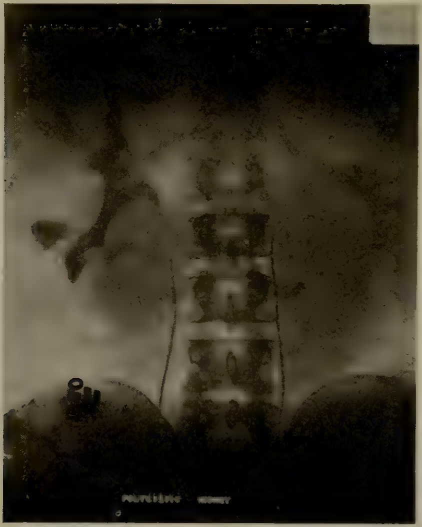

Fig. 436.—Polycystic disease of the kidneys.

Stricture of the Ureter.—The next two pyelograms are interesting as showing the presence of stricture of the ureter due to disease in the female pelvic organs.

The first pyelogram is that of a woman of fifty whom I had occasion to see four or five years ago with an attack of colon bacillus pyelitis. She again consulted me because of the presence of backache and frequency, which symptoms she attributed to a return of her old trouble. A pyelogram was made, and this shows the presence of a small hydronephrosis and an enormous dilatation of the ureter (Fig. 437). A subsequent

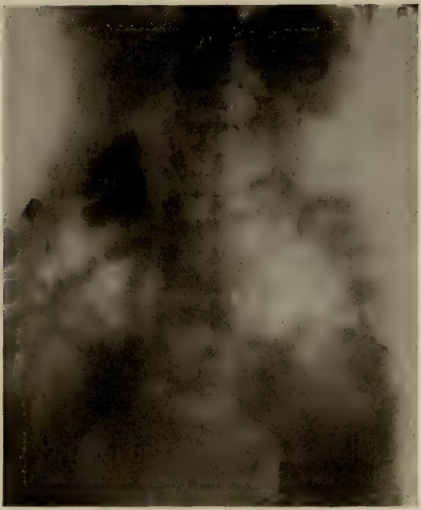

Fig. 437.—Ureter stricture due to primary carcinoma of the right ovary.

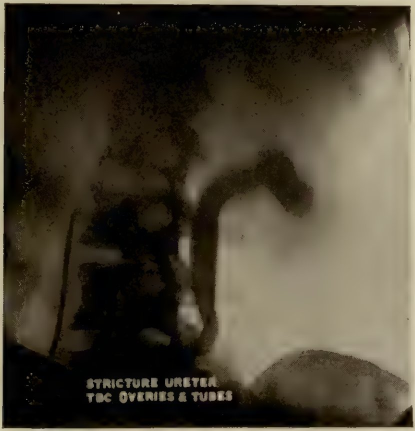

Fig. 438.—Ureter stricture due to tuberculosis of both ovaries and tubes.

operation revealed the presence of a primary carcinoma of the right ovary which accounted for the stricture of the ureter and the hydronephrosis.

In the second case the stricture was due to the presence of tuberculosis of both ovaries and tubes (Fig. 438).

Often one is confronted with the problem of determining whether an abdominal tumor is of renal or extrarenal origin. On the left side this problem concerns chiefly a differentiation between lesions of the spleen and lesions of the kidney. As a rule the blood-picture gives one a clue. However, there are certain instances in which this aid fails us.

The pyelogram that I wish to show now is of a young woman who came in because of the presence of a tumor mass in the left upper quadrant. An examination of the abdomen showed the presence of a swelling about twice the size of a normal kidney. Various consultants were called, most of whom thought the enlargement was due to the kidney, particularly as the blood-picture was normal. A pyelogram was made, and this showed a normal pyelogram. As the pyelogram was normal, I made a diagnosis of extrarenal tumor, probably spleen. It was difficult for me to reconcile myself to the fact that the pyelogram was normal in the presence of this enlarged mass. At operation the kidney proved to be normal and an enlarged spleen was found.

Lesions of the liver and biliary tract occasionally call for differentiation.

The pyelogram that I wish to show you now is that of a young man who had both gastric and urinary symptoms. Subsequent examinations showed that his urinary symptoms were due to a colon bacillus infection. A plain Roentgen ray showed the presence of three shadows. From the position of these shadows a diagnosis of renal calculi had been made, although from the plain *x*-ray I made a diagnosis of gall-stones because careful inspection of these shadows showed they had a light center, but in order to differentiate between renal calculi and gall-stones in an extremely long gall-bladder, a pyelogram was made and, as you see, this shows the kidney pelvis to be normal in size and position, and a diagnosis of gall-stones was verified later (Fig. 439).

The next pyelogram I wish to show is one of a woman who had an enlarged mass on the right side, the origin of which was not clear. A tentative diagnosis of enlarged right lobe of the liver was made. In order to exclude the possibility of a renal

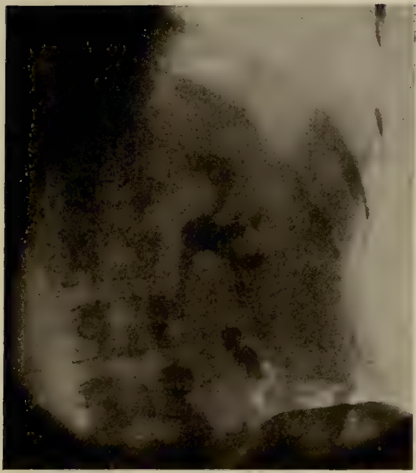

Fig. 439.—Gall-stones.

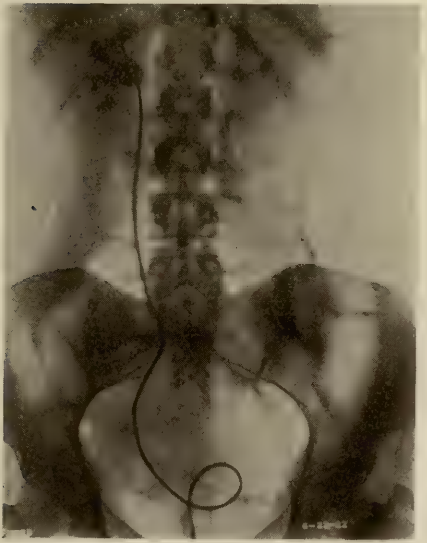

Fig. 440.—Normal pyelogram. Note prolapsed liver.

tumor a pyelogram was made, and this showed a normal pyelogram, and in this picture we were fortunate enough to obtain a rather sharp outline of the tumor under discussion, which showed it to be a prolapsed liver (Fig. 440).

Many more examples of these types of extrarenal tumor could be cited.

Other lesions of the liver call for differentiation from the kidney. Recently this problem arose in a case of carcinoma of the liver in a woman of sixty who had a profound anemia and an enlarged palpable mass on the right side. The pyelogram was normal, from which the renal origin of the tumor mass was excluded. At operation a primary carcinoma of the liver was found.

Lesions of the pancreas may occasionally be confused with renal lesions, and call for differentiation, which can very easily be established by means of pyelograms.

From the foregoing cases it is seen that in handling these problems of differentiation between tumors of renal and extrarenal origin we have had most gratifying results with pyelography.

CLINIC OF DR. DANIEL N. EISENDRATH

MICHAEL REESE HOSPITAL

TUMORS OF THE KIDNEY

Hypernephroma of the Left Kidney. Value of Pyelography in Early Diagnosis of Renal Neoplasms. Technic of Removal of Tumor. Discussion of Renal Neoplasms.

THIS patient was operated on November 13, 1922 for a hypernephroma of the left kidney. My reasons for presenting her are to direct your attention to the possibility of making an early diagnosis of a renal neoplasm by pyelography, and also to emphasize the necessity of the employment of an operative technic which enables one to ligate the renal vein before mobilizing the tumor itself, a necessary procedure if one wishes to avoid forcing some of the tumor thrombus into the vena cava.

This woman is forty-four years old and consulted me because of pain in the left upper quadrant of the abdomen accompanied by progressive loss of weight and strength. This pain began eleven months before being seen by me, and varied greatly both in intensity and duration. For the past six months there have been a number of distinct attacks of this pain most marked over the left iliocostal space. During the entire period there has been a slight rise of evening temperature, but a complete absence of any disturbances of urination and of hematuria. Her previous history was negative, and upon physical examination nothing abnormal was to be found except tenderness over the left kidney, only the lower pole of which was distinctly palpable at the level of the umbilicus. This lower pole felt smooth and presented a normal rounded contour.

A urologic study revealed the following: By ordinary radiography one could see the shadow of a somewhat enlarged kidney, but of normal outline. There were no changes in the bladder mucosa, but a moderate injection of the lips of both ureteral orifices. No obstruction to a No. 6 catheter was encountered in either ureter. There was an excretion of 9 c.c. of urine in seventeen minutes from the right kidney, but none escaped from the left ureteral catheter after forty-five minutes. Phthalein appeared in concentrated form in nine minutes on the right side, but none on the left side. Microscopic examination showed a few leukocytes in the right urine, but no specimen was obtained from the left side.

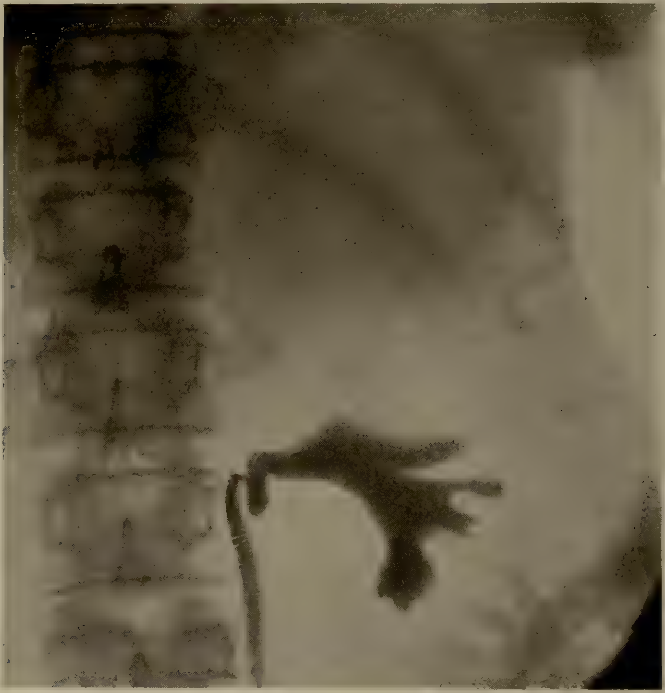

Fig. 441.—Pyelogram of case reported in clinical lecture showing typical filling defect of upper calyx and kinked ureter in hypernephroma of upper two-thirds of kidney.

Pyelography (using a 12 per cent. solution of sodium iodid) revealed a typical filling defect involving the upper calyx of the left kidney (Fig. 441), a crowding downward of the remaining calices, and a marked kinking of the ureter close to the renal pelvis. Our preoperative diagnosis was tumor of the upper half of the kidney, which had invaded the pelvis and produced the filling defect and displacement downward of the entire kidney.

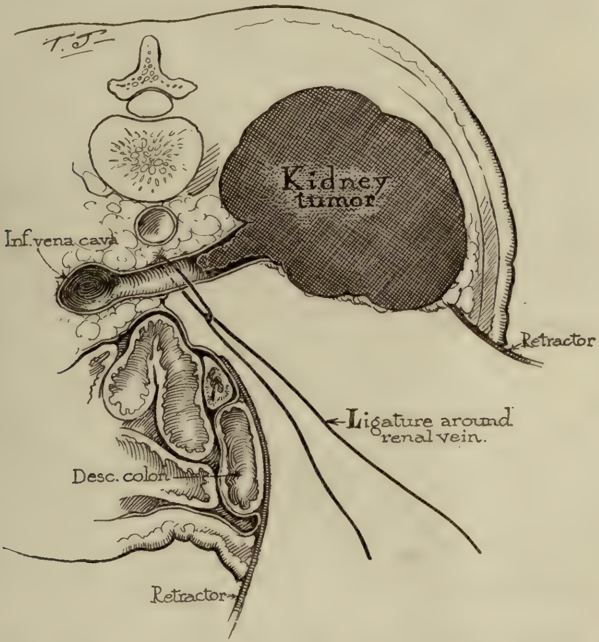

Fig. 442.—This illustration shows the principle upon which the operation for removal of renal tumor is based. The peritoneum and intraperitoneal viscera have been retracted toward the median line, the renal pedicle isolated with a ligature placed around the renal vein as close as possible to the vena cava beyond a tumor thrombus which has extended into the renal vein.

At operation on November 13, 1922 the usual lumbar kidney incision (Fig. 443, *B*) was made. Upon exposure of the perirenal fat a large number of very much dilated veins (Fig. 444) was seen. After ligating several of these, one was able to see the surface of the kidney, which was the size of the adult head, extending far upward under the left dome of the diaphragm and presenting on the surface at the junction of the two halves.

several of the yellowish firm nodules so characteristic of a hypernephroma. In order to secure access to the renal pedicle, especially its veins, in order to prevent the propulsion of a possible tumor thrombus (Fig. 442) into the vena cava and from here into the general circulation, it became necessary to employ a technic which would enable me to ligate the pedicle first before beginning the mobilization of the tumor itself.

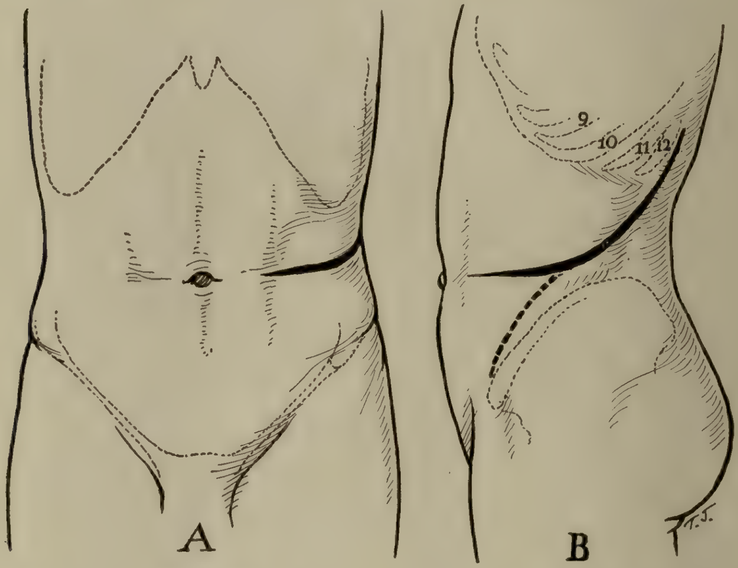

Fig. 443.—*A*, Extension of ordinary nephrectomy incision forward to outer border of rectus muscle on either side. The abdominal muscles are incised down to the peritoneum which is displaced inward to the colon. Compare with *B*. *B*, Lateral view. The dotted line shows extension downward of usual kidney incision which is omitted and replaced by a transverse incision extending to outer border of either rectus muscle. (Compare with *A*.)

After the patient was placed in the full dorsal position an incision was made transversely (Fig. 443, *B*) to the outer border of the left rectus muscle as an extension of the original lumbar incision (Fig. 443, *A*). Upon reaching the parietal peritoneum it, together with the descending colon, was pushed inward (Fig. 442) almost to the midline of the body. It is surprising how easily this can be carried out without opening the peritoneal cavity. The entire tumor with its dilated perirenal veins (Fig. 444) was now exposed and the renal pedicle was accessible without disturbing the position of the tumor. A possible tear of the peritoneum was avoided by placing thick gauze pads between it and the retractors. The renal vein which was the size of the adult little finger was isolated and ligated with kangaroo tendon as close as possible (Fig. 445) to the vena cava. A second ligature was applied nearer the hilus of the kidney to prevent the escape into the wound of particles of a possible extension of the tumor into the vein. The renal vein having been divided between these two ligatures, the renal artery was next taken care of, and search made for accessory vessels to the upper and lower poles.

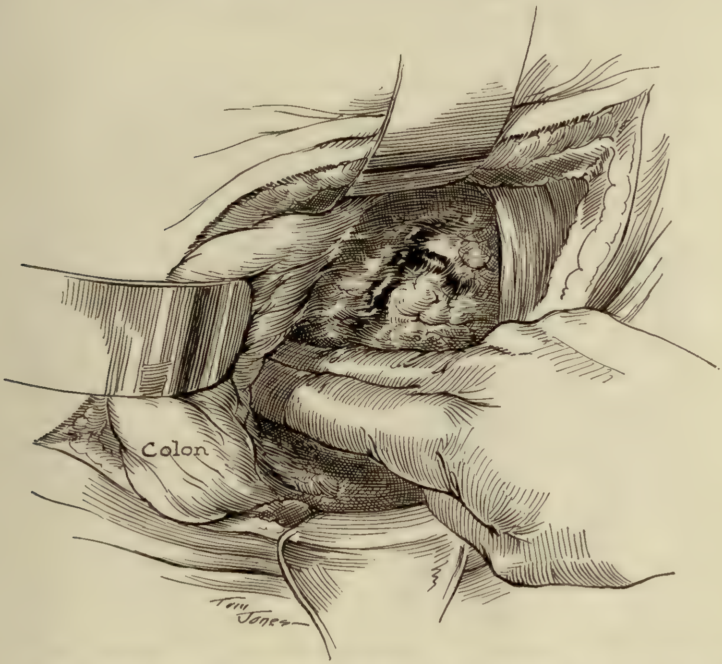

Fig. 444.—This illustration shows how the peritoneum and colon are pushed toward the median line so as to expose the renal vessels. The peritoneum has not been opened or the kidney tumor mobilized. Note the varicosities in the perirenal fat over the kidney tumor.

The removal of the renal tumor from its bed was now accomplished without any loss of blood or danger of forcing tumor particles into the circulation. The closure of the wound in the parietes presented but little more difficulty than that of the ordinary lumbar incision (Fig. 443, *B*). The gross appearance of the removed kidney (Fig. 446) confirmed the diagnosis of a neoplasm involving the upper two-thirds of the organ. On the surface there were a number of yellowish-brown nodules, and on section, in addition to considerable degeneration in the upper part of the tumor, one could see an extension into the upper half of the renal pelvis (Fig. 446).

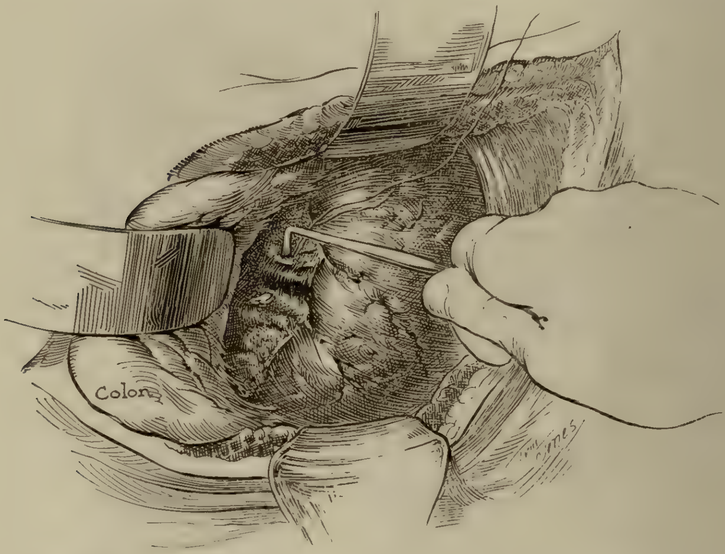

Fig. 445.—The colon and unopened peritoneum are retracted toward the median line and an aneurysm needle armed with kangaroo tendon is seen encircling the renal vein as close as possible to the vena cava prior to ligation beyond any tumor thrombus. (Compare with previous figure.)

The pyelographic medium could not displace this solid ingrowth, and hence the filling defect in the pyelogram. The fact that the tumor occupied the upper two-thirds of the kidney also explains the crowding downward of the lower calices. As the tumor developed it also pushed the remaining portion of the kidney and its pelvis downward, which explains the presence of the kink (Fig. 441) as seen before operation.

The microscopic examination by Dr. B. Portis confirmed the diagnosis of hypernephroma. There was considerable hemorrhage into and necrosis of the neoplasm. The patient has made an uneventful recovery thus far. The wound healed by primary union and there is no bulging upon coughing of the abdominal wall in the vicinity of the large incision.

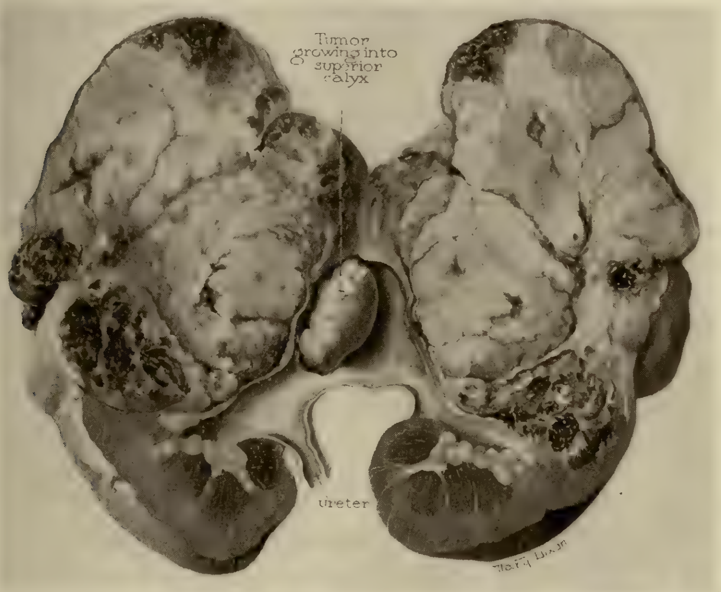

Fig. 446.—Appearance of a kidney whose upper two-thirds is the seat of a hypernephroma. Note a portion of the tumor growing into superior calyx of renal pelvis. (Compare with pyelogram of same case shown in Fig. 441.)

Looking back over the clinical history and operative findings certain features stand out. These are the absence of hematuria and of a palpable enlargement of the kidney, which, as you know, constitute two of the triad of conditions so frequently found in neoplasms of the kidney. The only symptom which led one to suspect some lesion of the upper urinary tract was the presence of pain over the left upper quadrant of the abdomen and over the iliocostal space of the same side. Neither cystoscopy nor ureteral catheterization were of aid in making a diagnosis. The latter was based exclusively upon the presence of a filling defect in the pyelogram (Fig. 441) which we have learned to interpret as due to the invasion of the renal pelvis by a tumor.

Both benign and malignant neoplasms can give rise to changes in the outline of the pyelogram, so that one cannot state definitely the nature of the underlying cause of the distortion, at least in the early stages, from the pyelogram. Let us review briefly some of the more important observations upon the subject of renal neoplasms, especially those relating to the clinical side. The first to be considered is the variety of tumor.

In this subdivision one immediately encounters, as elsewhere in the body, an anomalous situation. A comparatively frequent form of enlargement is that known as polycystic kidney which develops as a rule in both kidneys, and sooner or later causes an atrophy of the parenchyma between the individual cysts as effectually as though it had been invaded or pushed aside by a neoplasm of the malignant type as shown in today's case. There are a few supporters of the theory that the condition may be a unilateral one, but I will not speak of this here, as the entire subject has been taken up in a previous clinic.[1]

For clinical purposes it is important to know that these cases of congenital cystic kidney present themselves under the same clinical picture as is true of neoplasms, such as carcinoma and hypernephroma. By this I mean that the presence of a tumor, of hematuria, and of pain, yes, even changes in the outline of a pyelogram, are as characteristic of a congenital polycystic kidney as of one of the varieties of tumor which we generally understand as belonging to the true neoplasms. If the cystic changes are predominantly unilateral it is often impossible to make a diagnosis before operation. Never fail to palpate the opposite kidney and have a pyelogram made, no matter how typical may be the changes on the side suspected to be the seat of the neoplasm. In a recent case[1] the pyelogram and palpatory findings were thought to be typical of a hypernephroma until we found that the opposite kidney was the seat of a less marked nodulated enlargement, and a pyelogram of this side revealed similar changes in the pelvic outline.

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[1] Surgical Clinics of Chicago, October, 1919, 3, 1057.

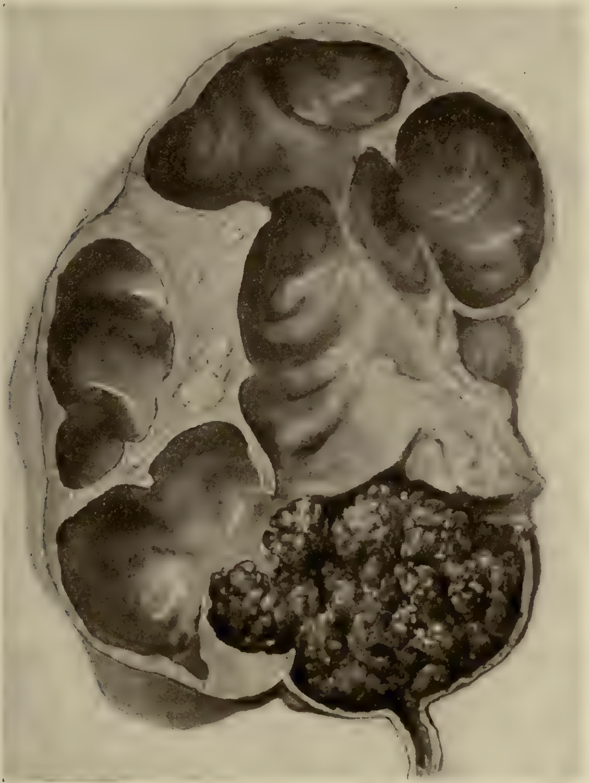

Fig. 447.—Large papilloma of renal pelvis causing hydronephrosis. (After Brutt.)

Having directed your attention to these cases of polycystic kidneys which, as Berner has shown, are due to a lack of union of two portions of the urinary tract, let me mention those forms of renal tumors to which we refer when we speak of neoplasms.

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[1] This case will be reported later in connection with the pyelographic diagnosis of polycystic kidney.

For clinical purposes I have found that the following division of true renal neoplasms is the most useful:

1. *Primary neoplasms of the parenchyma:*
   - Epithelial type:
     - (*a*) Adenoma.
     - (*b*) Carcinoma.
   - Connective-tissue type.
     - (*a*) Benign—fibroma, myxoma, chondroma, leio- and rhabdomyoma, angioma.
     - (*b*) Malignant—sarcoma.
     - (*c*) Embryonal adenomyosarcoma—also called teratomata or mixed-cell tumors.
   - Neoplasms due to misplaced adrenal rests—hypernephroma.
2. *Primary neoplasms of the renal pelvis:*
   - Epithelial type:
     - (*a*) Papilloma.
     - (*b*) Papillary carcinoma.
     - (*c*) Epithelioma (squamous celled).

Every one who expects to be able to interpret the clinical pictures under which these neoplasms present themselves should have at least a working knowledge of the chief pathologic features of each of these varieties of tumors, hence I will stop to consider them briefly.

Adenoma of the Parenchyma.—This rarely gives rise to clinical symptoms because it is very small (pea to bean size) and lies in the cortex as a circumscribed whitish tumor. Occasionally one finds a multilocular cystadenoma similar to that found in the ovary. I removed such a kidney from a child of four (Fig. 448).

Carcinoma of the Parenchyma.—The majority occur in adults, only a few having been found in children. They arise from the secreting tubules, and may present histologically either the features of a papillary or an alveolar adenocarcinoma. They may be nodular, with a distinct capsule, or invade the parenchyma in a diffuse manner (Fig. 449). They may invade the renal pelvis (Fig. 449) and grow into the veins and regional lymph-nodes, but the latter two complications occur at a much later period in the history of the growth than is the case in both hypernephroma and sarcoma.

Benign Connective-tissue Type Neoplasms.—Of these the only one of clinical interest is the angioma, which can give rise to severe bleeding when located at the tip of a papilla.

Sarcoma.—This is the most common type of tumor in children. It is usually of the round- or spindle-celled variety, grows very rapidly, and invades the veins at a comparatively early period. Many of the tumors reported as sarcomata in children in reality belong to the group of teratoids or mixed-cell tumors, there being a predominance of cells of the round or spindle type.

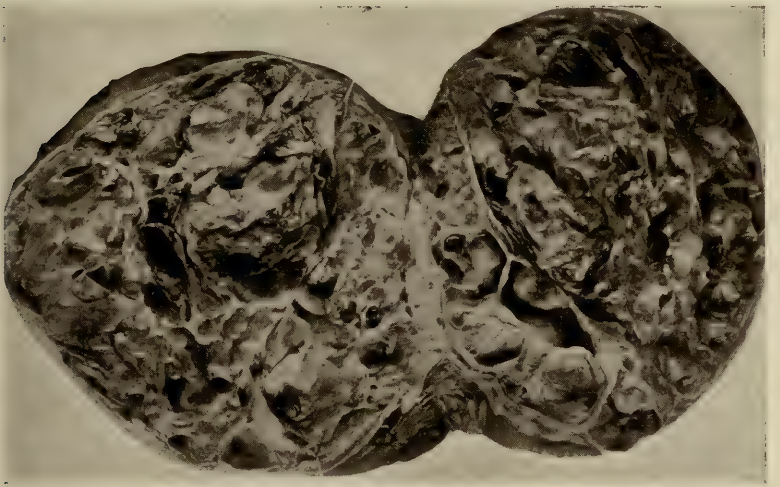

Fig. 448.—Cystadenoma of kidney removed from a child of four years simulating clinically a sarcoma of the kidney. Note remnant of kidney tissue at lower pole of tumor.

Embryonal Adenomyosarcoma—Also Called Teratoids, and Mixed-cell (Wilms) Tumors of the Parenchyma.—These rarely occur in adults. They resemble similar neoplasms of the testis[1] and salivary glands, and may reveal histologically almost every type of tissue as found in the embryo. According to the predominance of one or other type of cell, the histologic picture may be that of an adenoma or carcinoma at one time and of a sarcoma at another. The majority contain striped and unstriped muscle-fibers.

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[1] Schultz and Eisendrath, Archives of Surgery, May, 1921, 2, 493.

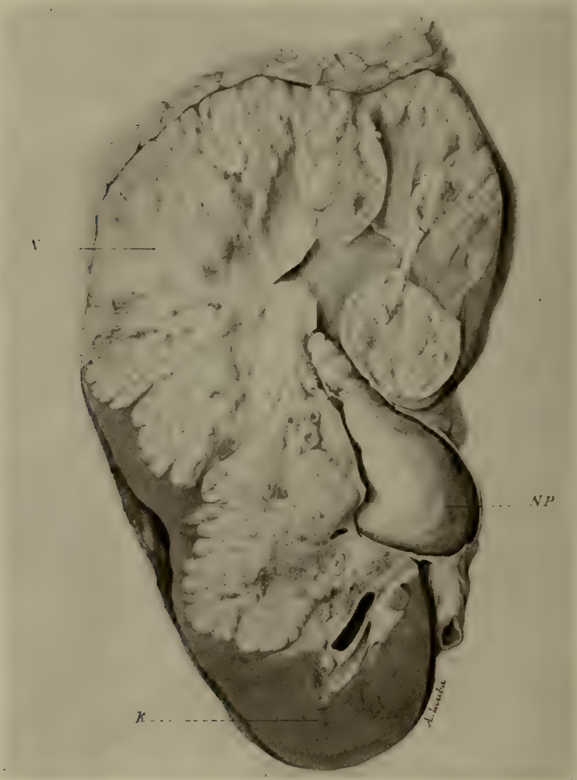

Fig. 449.—Carcinoma of kidney. Note how neoplasm (*N*) extends into renal pelvis (*NP*) and may obstruct ureter. Normal kidney seen at *K*. (Legueu.)

Hypernephroma.—The case presented in today's clinic belongs to this group of tumors due to the inclusion within the kidney of islands of tissue resembling in histologic structure that of the normal adrenal cortex. Clinically it is of importance to know that the majority are found in the upper pole, that they constitute about 60 per cent. of all renal neoplasms, that they grow into the venules, and from here into the main renal vein at a comparatively early stage, and finally that they are particularly prone to undergo retrogressive metamorphosis, such as cyst formation, necrosis, and hemorrhage. Invasion of the renal pelvis also occurs quite early (Fig. 446), thus giving rise to hematuria either directly or indirectly as the result of passive congestion, the blood escaping into the tubules and from there into the pelvis.

Papilloma and Papillary Carcinoma of the Renal Pelvis.—These types of tumors resemble in every respect the similar ones found in the urinary bladder. There can be no question that the influence of infection plays a great part in the development of these tumors. Of 57 cases collected by Darrell, calculi were found in 10 and infection in 10 cases. Just as tumors of the parenchyma invade the pelvis, so those which are primary in the latter structure may either grow into the parenchyma or cause a hemato- or hydronephrosis (Fig. 447) by obstructing the ureteropelvic junction.

Another feature especially characteristic of papillomata of the renal pelvis is the tendency for secondary implantations to occur in the ureter and bladder. Of 57 cases (Darrell, also Miller and Herbst), the ureter was also involved in 25, while in 18 the kidney, ureter, and bladder were the seat of growths. Every papilloma of the renal pelvis is capable of malignant changes, hence it is impossible before operation to state whether one is dealing with a benign or malignant papilloma.

Squamous-celled Carcinoma of the Pelvis.—These are comparatively rare, although there can no longer be any doubt that they occur chiefly as the result of chronic inflammatory proliferative changes. The tumor is usually quite large when discovered, but even a small growth may cause early obstruction of the outlet of the renal pelvis. This form of neoplasm must be differentiated from a leukoplakia of the pelvic mucosa or a choleastomatous condition as is found at times in tuberculosis and calculi.

Symptoms and Diagnosis.—Until recently we were obliged to base our diagnosis of kidney tumors upon three cardinal symptoms, namely, tumor, pain, and hematuria. Concomitant with the rapid development of urologic diagnosis, especially of pyelography, we are able to recognize the presence of a neoplasm of the kidney at a much earlier period in the clinical history than was formerly the case. I will enumerate and briefly discuss the value of the various data upon which we rely at the present time.

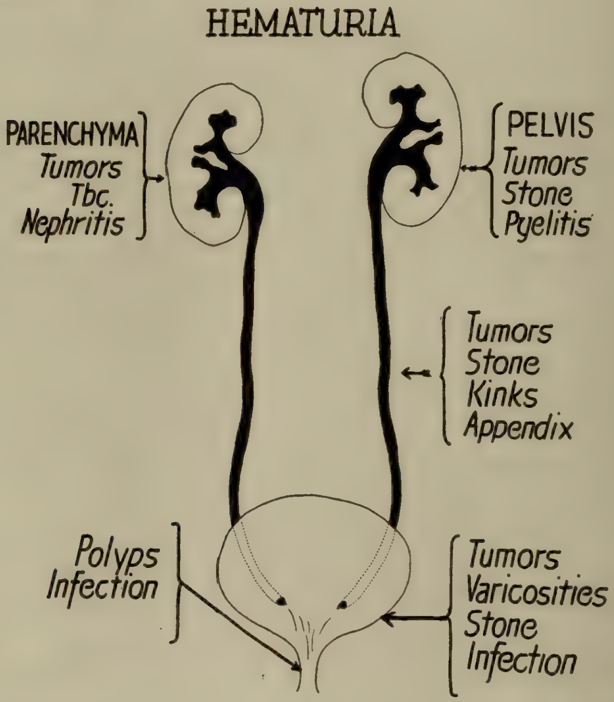

Fig. 450.—Diagram showing various causes to be considered in differential diagnosis of hematuria.

Hematuria.—This occurs as an initial symptom in 30 to 66 per cent. of the cases according to statistical tabulations of various authors. It occurs as an associated symptom, that is, either with pain, tumor, etc., in an average of 78 to 80 per cent. of all cases. There is a great variation in the duration and severity of the hematuria, and the same is true of its tendency to recurrence. As a rule the urine contains far more blood in the case of a renal neoplasm than in any other cause of hematuria (Fig. 450) except perhaps a papilloma of the bladder. There are exceptions, however, to this rule. I saw a case of severe granular pyelitis complicated by a pyelonephritis in which the clots and liquid blood simulated a hematuria due to a neoplasm. Another exception is in the case of congenital cystic kidney, where a severe hematuria may occur as an initial symptom, as is the case in true neoplasm. The passage of clots is responsible for the colicky pain, to which I will refer later. It is of interest to note that a severe hematuria may follow an injury to a kidney which is the seat of a neoplasm, and the same is true of a ureteral catheterization. In the majority of cases the hematuria is the result of an extension of a tumor of the parenchyma into the pelvis or of a primary growth into the pelvis proper, such as a benign or malignant papilloma. I cannot emphasize too strongly the fact that when a patient presents himself complaining of one or more attacks of hematuria, it is necessary to make a complete urologic study as to the source of the bleeding. There are many causes in the upper urinary tract (Fig. 450) which are in no way related to a neoplasm. I refer to chronic nephritis, granular pyelitis, congenital cystic kidney, calculi, and rarely to hydronephrosis. In some cases the bleeding may be due to passive congestion of the renal tissue in the vicinity of a tumor which has not extended into the pelvis, the blood escaping into the tubules, and from here into the renal pelvis.

Pain.—The pain in the majority of cases is of a dull aching character, as was complained of by our patient of today's clinic. It is located, as a rule, over the side where the neoplasm is situated. Such a dull, aching pain was found by Hyman as a primary symptom in 40 per cent. of 28 cases, and was an initial symptom in the Hochenegg Clinic at Vienna in 44 per cent. of a large number of cases. The pain may be of a neuralgic character referred along the course of distribution of the ilio-inguinal and iliohypogastric nerves. Next in frequency is a type of pain which simulates that of a typical renal colic. It is due to the passage of clots along the ureter and can be at once differentiated from the other causes of ureteral colic by finding relatively large or worm-like clots in the urine.

Tumor.—In adults the presence of a tumor is seldom an initial symptom. This is especially true of the cases where the neoplasm has developed in the upper half of the kidney and is difficult to palpate. In children, however, the presence of the tumor is often the first finding. The tumor is felt at some period or other in about 85 per cent. of all cases. In both adults and children it is especially important to palpate the opposite kidney because true neoplasms may occur simultaneously in both kidneys. The value of such palpation was impressed upon me by a recent case in which a pyelogram showed a typical deformity, and on palpation one felt a much enlarged, hard, nodular right kidney. Upon examining the left side a similar condition was found and pyelogram confirmed the diagnosis of a congenital cystic condition in both kidneys.

Left Varicocele.—This occurs so rarely that but little reliance can be placed upon its absence. It is due to the extension of a tumor thrombus into the renal vein so as to obstruct the return flow from the left spermatic vein. It was found to be present in 15 per cent. of the cases of hypernephroma reported from Hochenegg's clinic, but this is an exceptional finding.

Fever.—Some surgeons with large experience in this field, like Israel and Illyes, regard the presence of fever as typical of a tumor, but this view is shared by few others. It may last for months, rising to 104° F. every evening, as in a case recently reported by Scheele. In a sarcoma occurring in a young infant and operated by Doctors Harsha and Lawrence of this city, the presence of persistent fever (Fig. 451) led to a diagnosis of appendical abscess. In the case reported in today's clinic the patient had an evening rise of temperature to 100° F., and this led us in an analogous manner, as in the case shown in Fig. 452, to think of a possible renal infection. The fever is considered to be due to an anaphylaxis as a result of entrance of parts of the tumor into the circulation.

Solitary Metastases.—The most frequent location of secondary growths is in the lungs, long bones, sternum, skull, and spine, and although they occur less frequently in children than in adults one must bear this condition constantly in mind when a diagnosis of a primary bone tumor is made. In the case of hypernephromata the metastasis is often discovered months or even years before there are localizing symptoms referable to the kidney.

Reflex Ileus.—My reason for directing your attention to this syndrome is that one may encounter cases in which the predominating symptoms are those of an acute ileus. This may be due to a massive hemorrhage into a tumor or the passage of clots from the kidney to the bladder. It is a purely reflex condition and due to the intimate relation of the renal and intestinal innervation.

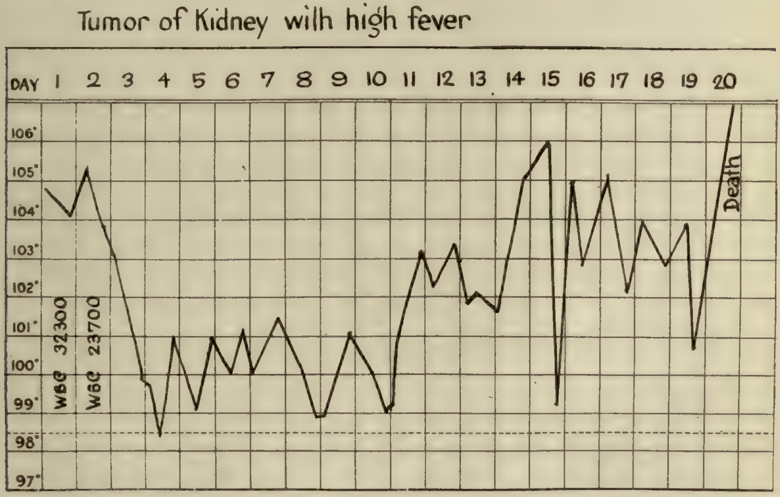

Fig. 451.—Temperature chart from case of sarcoma of the kidney in child of four, with high fever, simulating appendical abscess. (Case of Dr. Lawrence.)

Urologic Study.—The principal features of interest in this portion of the diagnosis are the ability to see blood escaping from the ureter of the affected side, and less frequently the presence of a papilloma protruding through the ureteral orifice.

Aside from this the cystoscopic examination presents no characteristic features. Of greater value is the interpretation of the ureteropyelogram and the functional tests. In regard to the latter one must always suspect the presence of a neoplasm when there is marked diminution or even absence of excretion of dyes from the affected side. In regard to pyelography I cannot emphasize too strongly the great value of this method of examination. In the case presented today it enabled us to make a diagnosis of renal neoplasm in the absence of any other symptom except pain and slight evening rise of temperature. The principal changes in the pyelogram are: (*a*) The presence

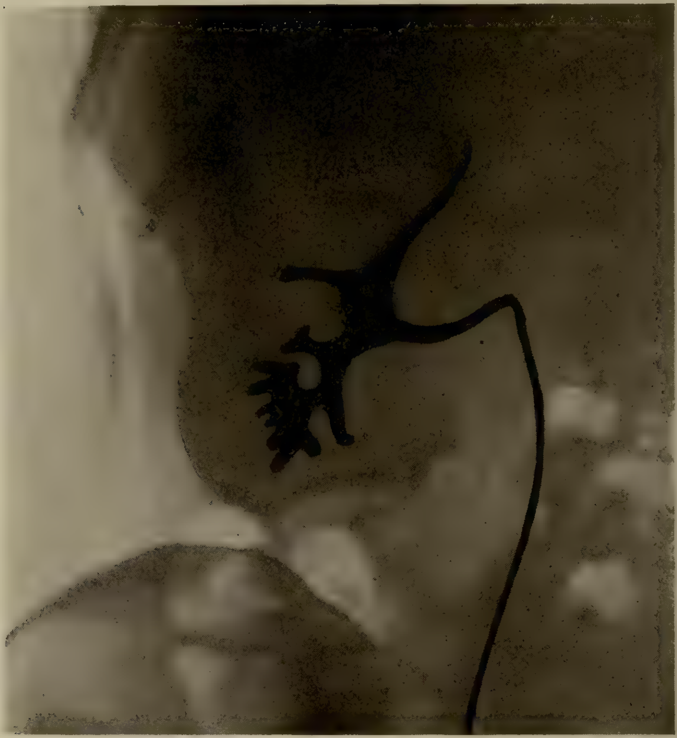

Fig. 452.—Pyelogram of case of hypernephroma showing typical spider-like distortion of the normal renal contour. (Kindly loaned by Drs. Derge and Ziegler.)

of a filling defect (Fig. 441); (*b*) the distortion of the outline of the calices until the so-called spider form (Fig. 452) is attained; and (*c*) the presence of a hydronephrosis due to obstruction of the outlet of the renal pelvis (Fig. 447). Of course there is nothing pathognomonic in the hydronephrosis due to a neoplasm, but when it is associated with distortion of the renal calices and hematuria it is at least suspicious.

Treatment.—The ideal method of treatment would be to do a bloc removal of the kidney itself, its fatty capsule, and the lymph-nodes at the renal hilus, and to ligate the renal vein first before mobilization of the kidney (Figs. 442–445). The veins were found involved in 13 of 86 hypernephromata by Bloch and in 4 of 19 by Wright. Hence, our first consideration should be to prevent the transmission into the general circulation of a tumor thrombus (Fig. 442). Rehn has proposed attacking cases in which the tumor has extended into the vein and even into the vena cava by radical method. In one case he resected a portion of the vena cava itself with the tumor thrombus successfully.

The ordinary lumbar incision does not always suffice to render it possible to carry out the ideal bloc removal of renal tumors. Krönlein and, later, Gregoire suggested a paraperitoneal route, in which the colon and unopened peritoneum are displaced inward (Figs. 442, 444) so as to enable the renal vein to be ligated before the tumor is mobilized (Fig. 445). Bazy has suggested a transverse incision where Krönlein and Gregoire utilized a trap-door-like incision. In the case which I have presented in today's clinic I began with the usual kidney incision (Fig. 443, *B*), but on account of the fixation of the tumor and inaccessibility of the renal vein I employed the technic described by Krönlein, and extended the incision to the outer border of the right rectus muscle to displace inward the transverse colon and unopened peritoneum. And I can warmly recommend this technic if one wishes to ligate the renal vessels before attempting to deliver the tumor itself. One cannot determine, except by direct palpation of the main renal vein, whether a tumor thrombus is present or not, and I believe we will greatly improve our end-results in these cases by primary ligation of the renal vessels close to the aorta and vena cava as a matter of routine without such palpation.

In closing today's clinic let me urge that radiograms of at least the lungs and, if possible, also of the long bones be made before any operation for removal of renal neoplasms.

CLINIC OF DR. CARL BECK

North Chicago Hospital

GASTRIC AND DUODENAL ULCER WITH SPECIAL REFERENCE TO LOCAL ANESTHESIA IN OPERATIONS

A Résumé of Present-day Methods of Treating Gastric and Duodenal Ulcers in the European Clinics. The Use of Local Anesthesia in These Operations. Personal Experience in This Method.

In the diagnosis and treatment of gastric and duodenal ulcer surgery has made a most important advancement in our time. Not to a slight degree is this progress a merit of our American surgeons. Only a few years ago the existence of duodenal ulcer and especially the frequency of such a condition was openly denied in Medical Congresses abroad. All surgeons were surprised by the statistics of W. J. and Charles Mayo; but after many surgeons had visited the Rochester Clinic and had seen the cases operated upon by Mayo and his assistants, they became convinced that they had missed the diagnosis and, therefore, the pathologic condition had been regarded as rare by them.

Another factor of great importance which brought enlightenment was the advance of stomach examination by fluoroscopy and pictures by the roentgenologist. Here again the credit of having pushed this knowledge belongs to Americans, although credit must be given to such men as Holzknecht, Haudek, Schmieden, and others. The treatment of duodenal ulcer is still a very disputed topic. The pendulum is swinging between extremists in medical treatment and rapid operators; but the majority of surgeons and physicians are in accord that the individual indication is the paramount issue, and most of them are of the opinion that the ulcer ought to be given a chance to heal under medical treatment, and then, if there is no good result, to treat it surgically.

It is of great value to review from time to time the active state of affairs, and to induce the surgeon who has failure and disappointments to rectify his views, change his methods, and to the medical man who has the mortifying experience of losing cases by hemorrhage or to hear the verdict "too late" because of procrastination by him to reform. It is a good thing to review the methods as they are in vogue in the surgical centers in civilized countries and to allow the surgeons to draw their own conclusions.

It has been my good fortune to visit within the last six months some of the most progressive centers (medical and surgical) abroad and watch the treatment of a large number of cases.

My experience in my own practice has been that of the majority—surgical treatment after failure of medicine—a cure in a large number of cases, some failures, some fatalities.

While visiting the best clinics of England, France, Switzerland, Germany, Austria, and Italy, I have observed an enormous increase of operations for ulcers of duodenum and stomach when compared with former times, and, strange to say, in those countries where they were so reluctant to accept the existence of these pathologic conditions the operations are the most frequent. Two facts have impressed me more forcibly than anything else besides this increase of operations, that is, the use of local anesthesia and the very radical method of resection.

In those clinics where the surgeons were conservative the results, as I was told and as I could see myself, were not as good as in those places where the radical resection was practised. Gastro-enterostomy seemed to be on the Continent only practised by that group of surgeons who are followers of authority and have conservative tendencies. I have seen a large number of resections after gastro-enterostomy that failed to relieve the symptoms or even produce the bad results of jejunal ulcers.

The most extensive operations on the largest number of cases I saw in Austria and again in Vienna, although I was told by Professor Eiselsberg that he had just assisted in the one thousandth resection of stomach in one of his former assistant's clinics in Innsbruck. Unfortunately, there was no stomach operation on the two occasions when I was in Innsbruck, and I could not afford to wait; but I would very much liked to have seen the work of this operator, of whose work Professor Eiselsberg was so proud.

I saw in the practice of Professor Eiselsberg, Dr. Hans Lorenz, and particularly in the practice of Professor Hans Finsterer a large number of cases. All three performed a very radical resection of the stomach for duodenal ulcer, but used different methods of union of the stump with the small intestine; but they particularly differ in regard to the method of anesthesia —Lorenz using general anesthesia almost exclusively and Finsterer almost exclusively the anesthesia of the splanchnic nerve. The results of all three are very good, but numerically the method practised by Dr. Finsterer surpasses everything I have been able to witness. Perhaps it is best to describe one of the operations of duodenal or gastric ulcer as it is performed by this surgeon. A typical case is like this:

A patient prepared like anywhere else: First, locally on abdomen, anesthetized with novocain; then the anesthetic is injected into the parietal peritoneum where the abdominal wall is exposed. Then with a special long needle there are injected about 60 to 70 c.c. of a $\frac{1}{2}$ per cent. solution of novocain into the region between the aorta and vena cava back of the stomach and below the liver, whereupon the stomach can be easily manipulated for two to three hours without the patient feeling anything, even the traction of the stomach.

He operates very slowly and delicately, first, as a rule, separating the duodenum and then the stomach way beyond the median line to the left, leaving only about one-third of the stomach cavity, and joining the stump directly with the jejunum in the manner as Hofmeister or Polya have recommended.

These operations take him between two to three hours, according to the difficulty of the case. In almost every case where the ulcer is not clearly visible on the outside or distinctly palpable, he opens widely the stomach before the operation and exposes the pylorus and duodenum from the inside. I have witnessed within about four weeks over 20 cases of this operation by Professor Finsterer. There was no mortality, and some of the cases which I saw, three to four days after the operation, were in as good condition as if they had not been operated upon.

Through the kindness of the Professor I was given the privilege of experimenting first on the cadaver to practice the splanchnic anesthetic method, and I was also granted the unusual privilege of operating on 3 cases myself, with the kind assistance of Professor Finsterer, to satisfy myself of the practicability and the ease with which this method can be employed. All 3 resections (2 ulcers and 1 carcinoma) got along very well and did not require any other anesthetic. The greatest convenience in this method of local anesthesia seems to me to lie in the fact that a very slow and exact operation requires delicate handling of the tissues, and this seemed to account for the splendid results. No hurry, every stitch taken is a most artistic accomplishment, hemostasis is absolute.

In Professor Lorenz's clinic, by whose wonderful skill I was fascinated, I saw equally good results with the large resection under general anesthesia; he is a rapid operator, joins the stomach after sewing it up first by a special gastro-enterostomy of Kocher or Billroth method.

In Professor Eiselsberg's clinic I saw wonderful results obtained by the same surgical technic of large resection. They use mostly general anesthesia and occasionally local anesthesia.

Prof. Schnitzler, an adversary of local anesthesia, has good results of resection, averaging about 100 cases a year, and uses in everyone of them the wide resection.

In *Gratz*, Primarius Linhart, a very versatile and good man, does the same work, also in Professor Hacker's clinic the technic is the same.

In *Germany*, as far as I could see, in the very short time of my stay in Hamburg, Berlin, Munich, and Leipzig, the methods were about the same, but many gastro-enterostomies were performed.

In the *Swiss Universities* of Professor DeQuervain and the other clinics there is about equally divided opinion as to the radical method and the gastro-enterostomies.

In *Italy* the number of cases operated at different clinics of note are very similar, especially in the clinic of Professor Bastianelli, in Rome, I had the chance to see the most advanced methods of local anesthesia, although I was not fortunate enough to see just such cases as duodenal ulcer in his clinic; but I could see them in another clinic—in the Policlinico Umberto.

In *France* I had the chance to see some of the best work in the clinic of Professor Lecene and the surgeons of Hospital St. Louis, Hotel Dieu, and other hospitals. There the treatment of ulcer, as far as I could ascertain, was conservative. Since it is extremely difficult to find out just when a case of ulcer is to be operated, one cannot follow the cases so well, but what one sees is more gastro-enterostomy than resection. Some surgeons prefer local anesthesia or, rather, paravertebral anesthesia, most of the others general anesthesia.

In *London* I had a chance to see Dr. Fagge in Guy's, Charing Cross, and New Middlesex, and a number of other men in different institutions, treat ulcers of the duodenum in almost a typical manner of gastro-enterostomy, and, from what I could learn, with good results.

Summing up my experiences, I should say that the present tendency in Central Europe is for a very radical resection. The reason for this is given as the conviction of the surgeons that by removal of the tissues of formations of the acid secretion the recurrence is absolutely prevented, and that the function of the stomach is normal afterward.

The statistics of those radical operations show the smallest number of jejunal ulcers and the smallest number of cases with persistence of symptoms, while gastro-enterostomy is regarded as only successful in a portion of the cases.

I was particularly interested in seeing some cases in the medical clinic of Professor Singer, of Vienna, examined by fluoroscopy long after operations, and observed a perfect function of the stomach several years after large resection in a case operated by Professor Finsterer. At any rate, it will be interesting, since these methods will find followers in our practice to observe our results.

CLINIC OF DR. ALFRED A. STRAUSS

MICHAEL REESE HOSPITAL

ULCERATIVE COLITIS

Presentation of Two Cases of Ulcerative Colitis. Technic of Operation. Value of Surgical Interference in Chronic Cases.

WE have here this morning 2 very interesting cases of ulcerative colitis. The first patient gives a history of having been treated medically for two years for diarrhea, which at times became so constant that he was confined to bed for weeks. The stools the greater part of the time contained excessive amounts of blood. As you can see from the patient's appearance, he is very anemic, he must have lost a great deal of blood for a long period of time. His hemoglobin is 20 and his red count is 1,300,000. He tells the story of having been under medical treatment for many months at various hospitals, and he has at times improved somewhat, but in the last year has been gradually becoming weaker and more pale, and has lost so much in strength that now he is almost moribund. His temperature ranges from 100° to 102° F., and his pulse from 100 to 130. Within the last month he has complained of what was assumed to be a pleurisy, but in reality was probably an embolic affair in his lung which gave him all the symptoms of a pleurisy with effusion. This gradually disappeared. At the time of his embolic affair, he had a temperature ranging up to 103° F. Within the last two weeks he also evidently got an embolus in his femoral vein and developed a typical phlebitis. His leg is swollen and painful and he has a rise of temperature. You can readily see this is one of the very extreme cases of ulcerative colitis, and undoubtedly some of these infectious emboli are thrown into the circulation. So in presenting this case it is evident that it is one of the extreme cases of chronic ulcerative colitis and a typical end-result of too long-continued medical treatment without surgical interference.

I want to give you my idea of the relationship of medical to surgical treatment in this condition, and the real value of each, and what I believe is the sane way of handling such a condition. We have right now 4 cases on our hands which were treated by very competent medical men and the most modern and competent medical methods. Not one of these patients has improved one bit by this medical treatment, and 3 of the 4 have become distinctly worse during the period of medical treatment. This patient here this morning in particular has practically become exhausted and gone into a state of collapse that is almost beyond repair.

The pathology of the colon in this condition is a general ulceration and infiltration of usually the lower half of the colon, sigmoid, and upper rectum, and in many instances extends through the entire colon and even into the appendix. The colon is usually from four to eight times its normal thickness, is infiltrated, and its tissues hardened so it feels like a stiff rubber hose. It has an injected and reddened appearance and the mesentery is filled with numerous hardened lymph-glands ranging from the size of a hazelnut to that of an English walnut. Histologically, the outer walls are usually packed with round cells, lymphocytes, and areas of eosinophils. The inner muscular coat and submucosa are usually ulcerated. We find the typical leukocytic and lymphocytic infiltration with many round-cells and eosinophils.

The etiology is not well understood, but in many instances it has been shown that the predominant organisms that have been found from the washings and irrigations after the ileostomy are streptococci. The chief criticism that can be made against long and continued medical treatment is that it is physically impossible to cure such an ulcerative bowel as long as the intestinal contents are going through that bowel, no matter how careful the diet and medication may be. During the time that medical treatment is being carried on, which is usually from one to two years before the medical men decide that they cannot accomplish a good result, the colon is undergoing definite destructive changes of ulceration and infiltration which are bound to produce narrowing of the lumen, contraction, and scar tissue formation. When the healing process does finally take place, it produces a colon which has so many points of obstruction in it that a normal physiologic function cannot be restored. Therefore I believe that the proper treatment for ulcerative colitis is early surgical intervention in conjunction with medical treatment so that the bowel can be put at rest and cure effected before these formidable and advanced pathologic changes take place. For instance, I think a patient who comes to you with a history of recently having had diarrhea with bloody stools for a period of four to six weeks, and on *x*-ray examination shows a typical infiltrated colon, and if at the end of six weeks to two months medical treatment has not helped, he then should have surgical interference. If his blood-count and hemoglobin are low he should have a blood transfusion. We always use here the direct syringe method, as I will demonstrate this morning. Then I will do an ileostomy through a gridiron incision under local anesthesia.

We carry out our blood transfusion, as you see here, with two simple needle cannulas, which I have been using for some time. It is a large needle about the size of a cannula which has a trocar in it, is beveled at the edge the same as a spinal needle. About $\frac{3}{4}$ inch from the point is a small transverse projection through which a Cambridge needle can be placed. The needle cannula is plunged into the vein, the vein first being transfixed by a fine Cambridge needle. When the cannula is in the vein the Cambridge needle is withdrawn and then transfixed through the vein and the small opening in the cannula so it cannot slip forward or backward. The same is put into the donor. We now have three 100 c.c. Luer syringes and two basins, one of normal saline and one of sodium citrate solution. The syringe is first washed with saline and then rinsed out in citrate, but no citrate is left in the syringe but what will adhere to the wall of the glass syringe. The blood is now drawn from the donor and transferred to the recipient. With three syringes one is always being washed by the nurse, so that we always have a syringe ready for use, and the whole process of transferring 800 c.c. of blood usually takes, as it did in this case, about twelve minutes. I think this is a very simple and easy method of blood transfusion. It does not necessitate the cutting down and exposing of the veins as you do when you insert a cannula, and allows you the use of the same donor repeatedly if necessary. It has the advantage over the citrate method in that we get practically no chills or reactions, which is a very important factor in a patient of this kind, who is practically in a state of collapse. The chances for infection or anything happening to the blood are much less than when you are stirring or exposing the blood to the air.

We will now get the patient ready for the ileostomy. Before doing an ileostomy I usually make a small midline incision below the umbilicus to explore and inspect the sigmoid and colon, to learn the exact extent of the pathology in the abdomen, but this patient being in such an extreme state of exhaustion and the diagnosis being very definite, both from the *x*-ray and the proctoscopic examination, we had better simply do an ileostomy under local anesthesia, through a small gridiron incision just as we would for an appendix operation.

I now quickly infiltrate the various layers of the abdominal wall with $\frac{1}{2}$ per cent. novocain solution and expose the abdominal cavity. The cecum shows marked infiltration and also the ascending colon and appendix, so we must assume that the entire colon up to the ileum has undergone these marked changes. As you will notice, there is a marked line of arrest of the disease at the ileocecal valve and the ileum appears perfectly normal. We now pick up a loop of ileum about 4 to 6 inches from the ileocecal valve and make a knuckle of the ileum by suturing the sides of the mesenteric folds together with fine catgut to the extent of about 4 inches. This makes a typical knuckle of the ileum, which is now pulled into the gridiron incision and pulled up above the skin so the knuckle will protrude above the skin for about $\frac{1}{4}$ inch. The peritoneum is fixed all around the two loops of bowel with interrupted catgut and the various layers of the abdominal wall are also attached. The skin is now stitched with interrupted silk to the bowel, the small skin incision closed, and the bowel covered with vaselin. The knuckle of ileum is cut across transversely within twenty-four to forty-eight hours. I have never seen any abdominal wall infection from this procedure, and the operation does not produce any shock or any untoward operative complications. Within a very few days patients are absolutely relieved of any cramps and peristaltic pain that they formerly had, and the active hemorrhage from the colon is stopped within a short while. Within five to six days after the ileum is opened we start irrigating through the distal loop of the ileum with from 3 to 4 quarts of normal saline solution. After trying all forms of medication, such as 1 : 10,000 silver nitrate solutions, 1 : 10,000 potassium permanganate solutions, weak iodin solutions, and zinc chlorid solutions, we have found that normal saline irrigations are just as efficient as any other type of irrigation, and they should be carried on twice a day by placing a tube in the rectum not very high and irrigating by means of a large sized catheter through the distal loop of the ileum. It is not necessary to try and force the catheter in through the ileocecal valve. The solution will flow into the colon very readily without any discomfort or marked distention of the latter. Later on this irrigation can be increased to 6 to 8 quarts of normal salt at a time. I have one case in which we did not irrigate at all, simply doing an ileostomy, and the patient made a perfect recovery.

The next patient I would like to show you is one on whom an ileostomy was performed eleven months ago. The patient has since gained 80 pounds in weight, now weighing 180 pounds, and, as you can very readily see, is a robust, healthy man doing a full day's work. The ileostomy is still perfect and he wears an ordinary colostomy cap over it. He states that there is no inconvenience at all except occasionally when he gets a loose bowel. The only time this annoys him is at night and then only occasionally. Now this patient had blood in his stools for three years. He was treated medically for two years, with no results. Within three months after the ileostomy was performed the blood disappeared from the stools, and within five months there was practically no pus to be found. His hemoglobin increased from 30 to 95 and he has made a perfect recovery. The *x*-ray examination showed a slight stricture at the transverse colon. I want to warn you and emphasize that one picture of a colon is not conclusive at all, but must be checked up at least three times within a period of two weeks so that there can be no error. I believe that I will let him go another six months and if after *x*-ray examination the narrowing in the colon is not sufficient to warrant operative interference, I will then close the ileostomy. If the narrowing in the colon is sufficient to produce obstructive symptoms this can be easily tested by injecting a bismuth heavy paste through the ileocecal valve and seeing what symptoms the patient has, such as hyperperistalsis and pain. If the meal passes through very readily, the ileostomy can be closed with perfect safety. If there should be considerable pain, it is advisable first to make a midline or right rectus incision, and increase the opening in the transverse colon either by a lateral anastomosis or a widening of the lumen by a plastic operation. If this is performed successfully, the ileostomy can be closed later. It is best closed by resecting ½ inch of the exposed ileum on each side and then making an end-to-end anastomosis.

Occasionally a patient has made a perfect recovery as far as his weight and general health are concerned, but the disease has been so far advanced that the colon has become quite narrow and remains infiltrated. This infiltration usually extends down to the upper portion of the rectum. If this is the case, with the patient in excellent health and having gained in weight, rather than leave the ileostomy opening indefinitely it is best to go in and make a complete resection of the colon with a lateral anastomosis between the ileum and the upper rectum, or as high up as the bowel seems to be normal. It is fortunate that at least the midportion or upper rectum is quite free of disease even in extreme cases. This anastomosis does away with the presence of an abdominal ileostomy, and not infrequently the patient has good control of the bowels if the anastomosis can be made at the lower sigmoid or upper rectum.

I want to show you the second patient for operation in whom nine months ago we did an appendicostomy. At the time that we did the appendicostomy the entire colon, cecum, and appendix were infiltrated. The woman weighed 87 pounds; her hemoglobin was 35, red count 1,600,000, and she was practically moribund. Upon consultation with my medical colleague, Dr. Friedman, we decided to do a simple appendicostomy. Before operation the patient had two blood transfusions and every day had 1 quart of 5 per cent. glucose intravenously. Within two weeks she had gained sufficient strength and her general condition was such that an appendicostomy was done under local anesthesia, using a gridiron incision. The appendix was about ten times the normal size, with a typical thickening and infiltration of the various muscular coats, and also showed some slight ulceration at the point that was amputated later. Within a few days following operation the patient was given a third blood transfusion, and then daily for one week was given 1 quart of 5 per cent. glucose intravenously. The patient was given daily irrigations by the drop method. She picked up slowly, and later on, when she had gained, we gave her irrigations through the appendicostomy morning and evening of large quantities of normal salt solution. This patient gained about 35 pounds in weight, but her hemoglobin is still down to 40, her red count is down to 2,100,000, and she still has blood in her stools. She has made as much progress as is possible with this type of operation, and I think this is an excellent example of the difference between the effect of an appendicostomy and an ileostomy, and surely demonstrates the inefficiency of an appendicostomy.

We had a similar case about two years ago in which we had exactly the same experience. In this case, as we will do this morning, we amputated the appendix through the old incision and performed an ileostomy. It simply illustrates that simple irrigation is not sufficient, and by far the most important factor

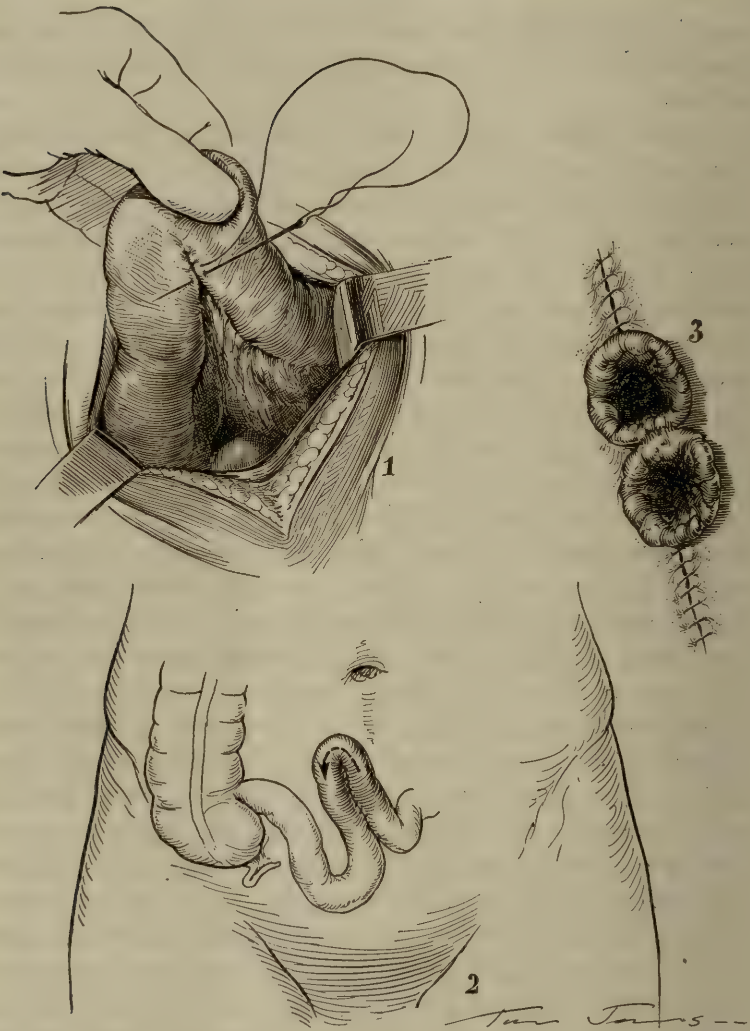

Fig. 453.—1, Shows suturing of the lateral wall of the bowel at its mesenteric attachment so as to form a knuckle of the ileum. 2, Shows the knuckle of ileum formed about 3 to 4 inches from the ileocecal valve. 3, Shows the ileostomy open.

to cure ulcerative colitis is to shut off the intestinal contents from going through the diseased bowel. This can only be done by complete ileostomy. To prove that this is true we have one case, as we have stated before, that was cured by ileostomy without any irrigation whatsoever. While I believe that the flushing of the pus and sediment and keeping the mucosa of the colon washed clean is a certain aid, after all, the important thing is to prevent contractions, peristalsis, irritations, and to put the colon at absolute rest. I will now dissect loose the appendix, amputate its remaining part, invert the stump, and then do an ileostomy. I believe this can be easily accomplished through the gridiron incision. I think it is an ideal incision for both an appendicostomy and an ileostomy. This can be easily done under local anesthesia. First we will dissect loose the various layers of the abdominal wall. You can readily see the appendix has elongated the head of the cecum by traction of the appendicostomy, and is very readily amputated. I will now expose the head of the cecum and part of the ascending colon, and I can say to you that this part of the bowel seems to have undergone a marked healing process. The thickness of the bowel wall is normal now, is not infiltrated, and has a healthy color as compared with four months ago, when it was thick, reddened, and infiltrated. I may be able to reach over and feel the sigmoid. This is, however, still hard and infiltrated. It seems in this case that part of the ascending colon and the transverse colon have healed, but very evidently the sigmoid is still infiltrated. The appendicostomy seems to have had very little effect on this part of the bowel. As you can very readily see, I can now with little trouble pull up the loop of ileum about 6 inches from the ileocecal valve and make a knuckle of it as I did in the previous case. I first suture with catgut the sides of the mesentery near the wall of the bowel so as to make a knuckle, then bring it through the gridiron incision just as I did in the former case. One important fact regarding the advantage of the ileostomy is that the patient does not have to diet after the operation. He can eat a mixed diet of anything or any amount he cares to. It is surprising the difference there is in these two operations in regard to the patient's gaining in strength and weight. The second point I want to make is that it is no more difficult to do an ileostomy through a gridiron incision under local anesthesia than an appendicostomy, and therefore I think there is no greater risk to the patient on account of his general condition to do an ileostomy than an appendicostomy.

CLINIC OF DR. EDWIN W. RYERSON

St. Luke's Hospital

SEPARATED EPIPHYSIS OF LOWER END OF FEMUR: TWO OPEN OPERATIONS

Boy of Nine with Separation of Epiphysis of Lower End of Femur, the Result of Being Caught in the Fly-wheel of an Engine. Open Operation Performed Shortly After Accident to Replace Epiphysis Resulted Unsuccessfully. Five Weeks Later Second Operation Performed. Result Excellent at Time Case is Presented.

This boy is nine years of age. On December 1, 1922 he was caught in the fly-wheel of an engine and whirled around, striking on the floor. His left elbow was broken, and the left tibia and fibula also, just above the ankle. The lower epiphysis of the right femur was torn loose, and was displaced about 2 inches upward on the anterior surface of the femur. Attempts were made by the family physician to replace the epiphysis, but without success. A few days after the accident an open operation was done by a local surgeon through an incision on the outer side of the femur, about 2 inches above the end of the femur. The epiphysis was placed in proper position and a wire gauze splint applied with the knee in 35 degress of flexion. The wound suppurated, but the knee-joint did not become infected. Five weeks after the operation an *x*-ray picture showed that the epiphysis had become displaced, and was again about 2 inches above the end of the femur on the anterior surface. The boy was then sent to the orthopedic department of St. Luke's Hospital. He was in poor general condition, but courageous and optimistic. His left elbow showed a nearly complete ankylosis. The fracture in the left lower leg was ununited, and a long plaster-of-Paris splint was applied at once. The right knee showed marked deformity and about 2 inches of shortening, as nearly as could be judged. The knee was very painful and tender, but not swollen or edematous. On the outer side of the thigh, about 3 inches above the end of the femur, was an unhealed incision 4 inches long, with pus exuding from its proximal end. The *x*-ray film showed the characteristic appearance of a displaced, separated epiphysis. It was considered probable that after five weeks of immobilization on a splint, together with a suppurating incision through the muscles of the thigh, the epiphysis would be so firmly fixed that an open operation would be required to replace it in the proper position. Accordingly, an attempt was made to induce the septic wound to heal by the use of Carrel tubes and Dakin's solution, but without success. Six weeks had now elapsed since the original operation, and, after much deliberation, it was decided that no further delay could be allowed. It was recognized that the danger of infecting the knee-joint was very great, but it was also recognized that if the epiphysis were not placed in its proper position a useless knee would result with a shortening of 5 or 6 inches when the boy had attained full growth. It was not considered that direct longitudinal traction in a Thomas splint or by a Buck's extension could possibly reduce the displacement to a satisfactory degree.

On January 15, 1923 the boy was placed on the operating-table and anesthetized with ether. The splint was removed, and the leg and thigh were scrubbed with benzine, and, after drying, were painted with iodin. The first stage of the operation was an attempt to excise and débride the suppurating wound on the outer side of the femur. The sinus, however, proved to run so far upward toward the hip, and the bleeding was so severe, that this plan was soon abandoned, and the wound was scrubbed out with iodin on gauze pads, and was packed with gauze strips. The entire leg was again painted with iodin, and instruments, gowns, gloves, and table drapery were changed. A tourniquet was applied, and a long incision was made over the front of the knee. The patella was split longitudinally with a hand-saw, and the quadriceps and patellar tendons were split with a knife.

On retracting the two halves of the incision, the articular surface of the condyles was seen facing directly upward toward the ceiling, that is, anteriorly. The epiphysis had, therefore, rotated around the end of the femur through an angle of 90 degrees and lay with its metaphyseal surface against the anterior surface of the femur. It was firmly united to the front of the femur, and could not be freed even after all of the soft structures at its sides and upper edge had been dissected off. There seemed to be a good deal of callus formation on both of the lateral aspects, as if mortar or cement had been plastered in the angle between the two bones. The crucial ligaments could plainly be seen, of unusual length, running down to the head of the tibia. The space between epiphysis and tibia was much greater than would have seemed possible to the writer, but there was no apparent rupture of any of the fibers of the crucials. With chisel and mallet the epiphysis was cut away from the femur, and with great difficulty it was gradually pulled downward into the proper position. This could not be done with the leg in the extended position, and was only accomplished by flexing the knee and by the use of a great deal of force. The epiphysis did not seem to fit accurately upon the diaphysis. It was not at all like adjusting a recent fracture, where the various serrations can be exactly fitted. It also showed no inclination to remain in any sort of apposition, but slipped upward again very easily. Accordingly, after placing it in what seemed to be the normal relation, with the knee flexed at a right angle, a hole was drilled with a $\frac{1}{8}$-inch drill directly through each condyle, on either side of the middle line, rather near the notch, and passing directly into the diaphysis. These holes were so placed as to avoid the centers of weight bearing, that is, the most dependent portion of the articular surface. It was felt that there was no risk of damage to the cartilage, since ivory, bone, or even metal nails and pegs can be set into joint surfaces without interfering with function. Two long ivory pegs, $\frac{1}{8}$ inch or a little less in diameter, were then driven up through the epiphysis into the femur. They seemed to hold the bones very firmly together. The soft structures were then carefully sutured, and the extensive wound was closed without drainage. During the dressing of the leg and after the removal of the tourniquet it was noticed that there was a large swelling in the back of the thigh, near the gluteal fold. This had not been observed before, probably because no thorough inspection had been possible on account of the extreme pain caused by any movements of the limb. An aspirating needle was plunged into the swelling, and pus was

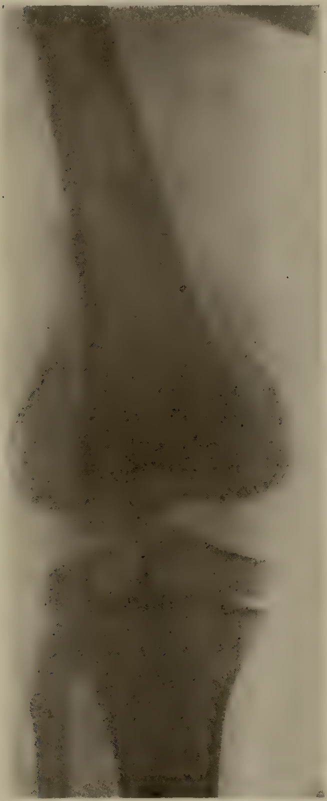

Fig. 454.—Roentgenogram taken day after injury, showing separation of epiphysis.

Fig. 455.—Roentgenogram, anteroposterior view, taken five weeks after first operation, showing epiphysis displaced about 2 inches above the end of the femur on the anterior surface.

found. A small incision evacuated a large amount of pus, nearly a pint, evidently a gravitation abscess from the infected wound of the original operation. The wounds were dressed separately and the leg was placed in the double inclined wire gauze splint.

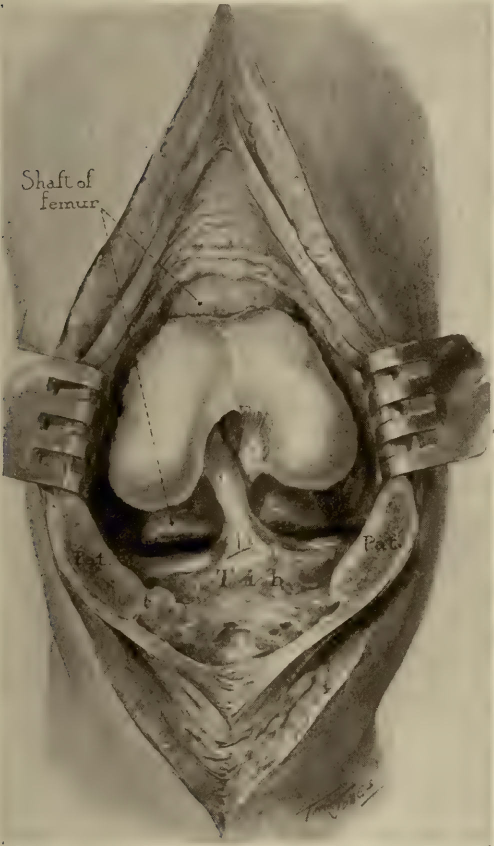

Fig. 456.—Drawing showing technic of second operation.

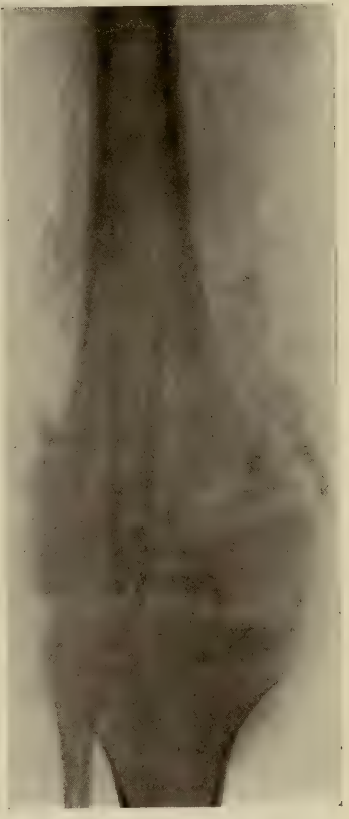

Fig. 457.—Roentgenogram taken five weeks after second operation, showing formation of periosteal callus.

Subsequent Course (February 21, 1923).—The operative incision has completely healed with only a small stitch infection at two points over the front of the tibia. The x-ray film shows the epiphysis in almost perfect relation to the femur. The wound under the thigh has closed, but there is still a little drainage from the original infected wound. The boy still shows an elevated temperature, from 100° to 101° F. (rectal) in the afternoon, but is comfortable and in excellent condition. There is good motion in the joint. It will be a matter of great interest to follow the course of this case because only time can tell how much shortening (or rather lack of growth) will result from the many insults to this epiphysis. It hardly seems probable that the knee-joint will become infected after the lapse of the past seventeen days, and it is to be hoped that the courage and cheerfulness of this brave little boy will be rewarded by a successful result.

CLINIC OF DR. GOLDER LEWIS McWHORTER

PRESBYTERIAN HOSPITAL

SOME IMPORTANT POINTS IN THE DIAGNOSIS OF GALL-BLADDER DISEASE; THE TECHNIC OF CHOLECYSTECTOMY

Patient Giving a History of Gall-stone Colic Coming on Six Months After Pregnancy. Findings at Operation. Technic of Cholecystectomy. Diagnosis of Gall-bladder Disease.

THIS young woman is twenty-three years old. She complains of attacks of pain in the right upper quadrant of the abdomen, with nausea and vomiting. These attacks come on suddenly with excruciating pain radiating to the region of the right shoulder-blade. They last about three to four hours, usually requiring a hypodermic, which does not completely relieve the pain. The soreness gradually but completely subsides in two or three days. One year ago she gave birth to a normal baby. The onset of these attacks was six months ago, six months following childbirth. The attacks come about every two or three weeks, but have been a little more frequent of late. They are more frequent after large meals than after small ones. The time of day is usually late afternoon, midnight, or 3 or 4 A. M. She has never been jaundiced. There have never been any chills or fever. Following the birth of the child she had indefinite pains throughout the abdomen until she wore a supporting corset.

Past Diseases.—She had diphtheria and measles as a child. Tonsils were removed three years ago for frequent colds and sore throats. She suffers from constipation.

Family History.—Parents, two sisters, and two brothers are living and well. History is otherwise negative.

Examination.—Patient is in good condition. Findings are negative except considerable tenderness over the gall-bladder region and muscle rigidity, explained by the fact that the last attack of pain was last week. Temperature in the hospital has been normal. White blood-count is 7200, hemoglobin 65 per cent.; blood-pressure 120/75. Urine is negative except for a very slight trace of albumin.

This case is illustrative of a group of cases, but I wish you to note particularly the absence in the history of infection and fever, and that the attacks followed very closely the pregnancy of a very young woman—which fact I shall comment on later.

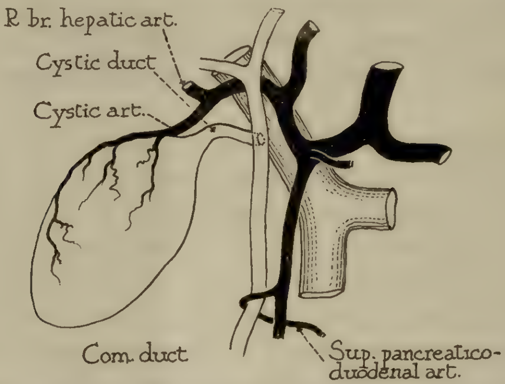

Fig. 458.—The most common relation of the right branch of the hepatic artery passing posteriorly to the bile-ducts. It gives off the cystic at the right. The superior pancreaticoduodenal artery is exposed to injury as it encircles the common bile-duct in this case.

Injury to the bile-ducts and the occurrence of hemorrhage are too frequent in gall-bladder surgery. A third difficulty which must be avoided is injury to the arterial blood-supply to the liver. It has been demonstrated that the ligation of the hepatic artery or its branches will produce necrosis of the corresponding lobe of the liver unless there is a rich collateral circulation. Fatal changes usually result from ligation of the hepatic artery in herbiverous animals, but are not so constant in carniverous ones.

Variations in the relations of the hepatic artery and its branches are so constant that I will point out the common ones which I noted in a study of the surgical anatomy from the dissections on 37 cadavers. Normally the cystic artery arises from the branch to the right lobe of the liver. The hepatic branch most frequently passes posteriorly to the hepatic bile-duct and the cystic arises usually after it has passed to the right side (Fig. 458). However, the hepatic artery or one of its branches may pass anteriorly to the bile-ducts, giving off the cystic artery, usually at the right side of the bile-ducts. The cystic artery may arise on the left side, where the hepatic branch then usually passes upward to the liver, and is not closely associated with the cystic artery in the region where it is ordinarily ligated during the removal of the gall-bladder. The cystic artery arose at the left of the bile-ducts in 32 per cent. in my series.

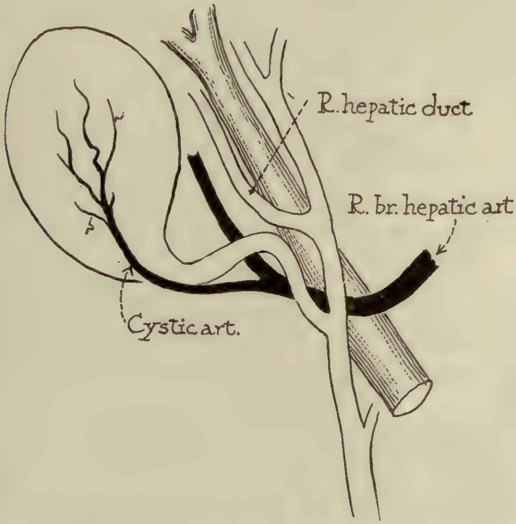

Fig. 459.—The right branch of the hepatic artery, the cystic duct, and the right hepatic bile-duct are close together. They form a danger zone in which the blood-supply and bile-duct of the right lobe might be injured in ligating the cystic duct and artery.

Where the cystic artery arises at the right of the bile-ducts there would be a possibility of injuring the arterial supply to the liver by mistaking the hepatic branch for the cystic or injuring it in ligating the cystic (Fig. 459). The cystic artery arose at the right of the bile-ducts in 68 per cent. of the cases. In 20 cases the vessel which gave off the cystic was the only branch to the right lobe of the liver. In 2 cases the common hepatic artery to the entire liver passed to the right of the bile-ducts, in close relation to the cystic duct, and might be easily ligated or injured.

Frequently the cystic arose from a hepatic artery, which came off from the superior mesenteric, and in one case from the aorta, and passed from below up in close relation with the common hepatic and cystic ducts, where it might be easily injured. The cystic artery usually passes anteriorly over the region of the neck of the gall-bladder, where it divides into its peripheral branches intimately associated with the peritoneal covering. It is this band of peritoneum to the neck of the gall-bladder which is left until the last, being partially freed so that the branches of the cystic artery may be ligated as peripherally as possible. This avoids the dangers of injury to the bile-ducts and lessens the possibilities of hemorrhage from a slipped retracted cystic artery.

Usually the gall-bladder has about one-third of its surface adherent to the liver, but in about 5 per cent. of the cases it has a distinct mesentery. It is important to dissect the cystic duct cleanly down to the common duct because of the danger of traction and of injury to it, because of the possibility of overlooking a small stone in the cystic duct, or of leaving too long a portion of the duct or neck of the gall-bladder which might later become inflamed. The cystic duct in my dissections entered the common duct posteriorly seven times, and once on the left side.

An important anomaly of the hepatic branches of the bile-ducts arose in 2 cases, where the cystic duct entered the right hepatic branch above its junction with the left branch. Under these conditions the right branch might easily be mistaken for, or clamped with, the cystic duct. This would be likely to occur following the method of dissecting the gall-bladder from below up.

Operation.—An adequate exposure is best obtained, I think, by means of a paramedial incision through the right rectus

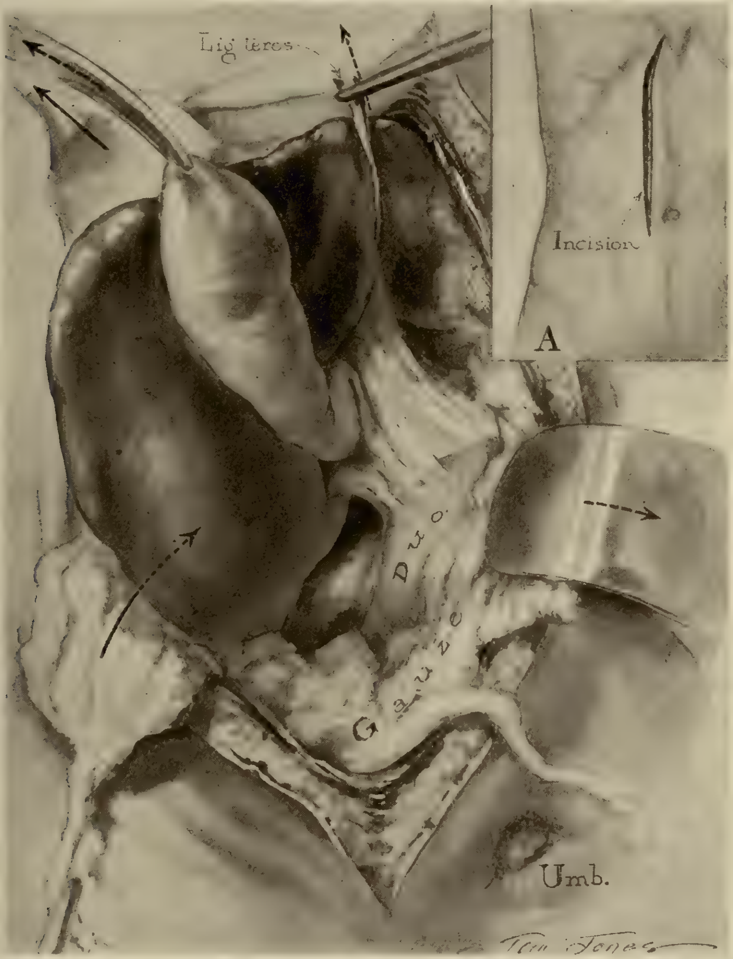

Fig. 460.—Method used in exposing the gall-bladder. A gauze pack is put at the right of the liver. The round ligament of the liver has been cut and is being used for traction. Arrows indicate traction.

muscle-fibers, and if more room is needed, by extending it to the right, as in Dr. Bevan's incision. I find on exploring the pelvis that conditions are normal, the left kidney is negative to palpation, the right kidney negative, and the stomach and duodenum are apparently normal. I can palpate several very small stones, perhaps a dozen, in the lower end of the gall-bladder. We will now put a retractor in the lower angle of the incision and explore the appendix. There are several hard masses within the lumen, which are probably fecaliths. There is nothing unusual in the technic of dissecting it. We will put a linen purse-string suture in, crush the appendix near its base, and ligate it with a piece of catgut. I will now take a cautery and burn the appendix off between two hemostats. This is the best way, I think, to avoid any contamination. We will now invaginate the stump inside the purse-string. I will take a fine catgut suture and invaginate this region a little more.

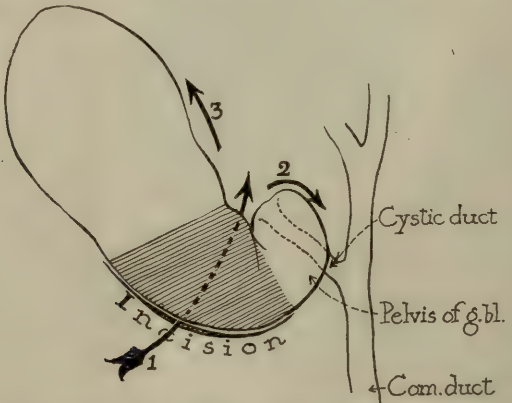

Fig. 461.—Diagrammatic sketch illustrating the several steps in this improved method of removing the gall-bladder: 1, This arrow indicates the direction of the preliminary dissection of the gall-bladder posteriorly from the right to the left side. The shaded area is the region freed posteriorly in this step. 2, This indicates the next steps, which are downward, first freeing the pelvis posteriorly, then lifting this up and dissecting down along the cystic duct. 3, This is the last step, after the lower end of the gall-bladder has been freed, the dissection of the still attached bladder from below up. Clamping of the cystic duct in such a low lying pelvis of the gall-bladder without open dissection might include or mistake the common bile-duct or the right hepatic branch resulting in serious damage.

We will take the retractor out, and put it in the upper right side of the incision and examine the liver and gall-bladder.

Upon palpation the gastrohepatic structures are apparently normal, and there are no stones palpable in the common duct. The pancreas is negative. I think it advisable to remove the gall-bladder. In order to get better exposure I am going to rotate the liver to the left, and put in a pack of gauze to maintain the position. Greater mobilization of the liver is obtained by cutting the round ligament, which we are using for traction (Fig. 460). In beginning the dissection I am holding the gall-bladder to the left so that I can make an incision along its right side at its attachment to the liver, extending from below, over the gall-bladder pelvis upward for about 2 inches parallel to the liver attachment (Fig. 461).

A line of cleavage is now easily formed between the gall-bladder and the liver. I am first using a blunt hemostat, but I will now take my finger and dissect under the gall-bladder, lifting it up and rotating it at the same time. You see that there is practically no bleeding. The bladder is now freed to the left peritoneal fold, and I will now peel it away from this fold, so that I can get my finger entirely beneath the bladder. The branches of the cystic artery usually pass along this peritoneal fold just below this region and course over the neck of the gall-bladder. An opening is now made in this left fold of peritoneum, which permits easier manipulation of the bladder for further dissection. If branches of the cystic artery run in the fold at the opening they are easily ligated.

I now rotate the bladder to the left, exposing the right side, and with my finger dissect the bladder free farther downward, cutting the peritoneum as I go along the right side. Anomalous branches of the cystic artery may run in this region. They are easily seen and picked up with the peritoneal covering. The pelvis which extends below the level of the neck of the bladder is now freed and I am turning it up and holding it with a forceps. This neck of the bladder is followed down along the cystic duct. The posterior attachments of the gall-bladder are usually formed of loose connective tissue, making separation easy. The anterior and the left peritoneal attachments of the neck and lower end of the bladder are intact. If there are anomalies of the bile-ducts or arteries they will not be endangered by this method of dissection. I have the cystic duct freed well down to the common duct. With the bladder held to the left, I am freeing the duct from the anterior and left peritoneal fold.

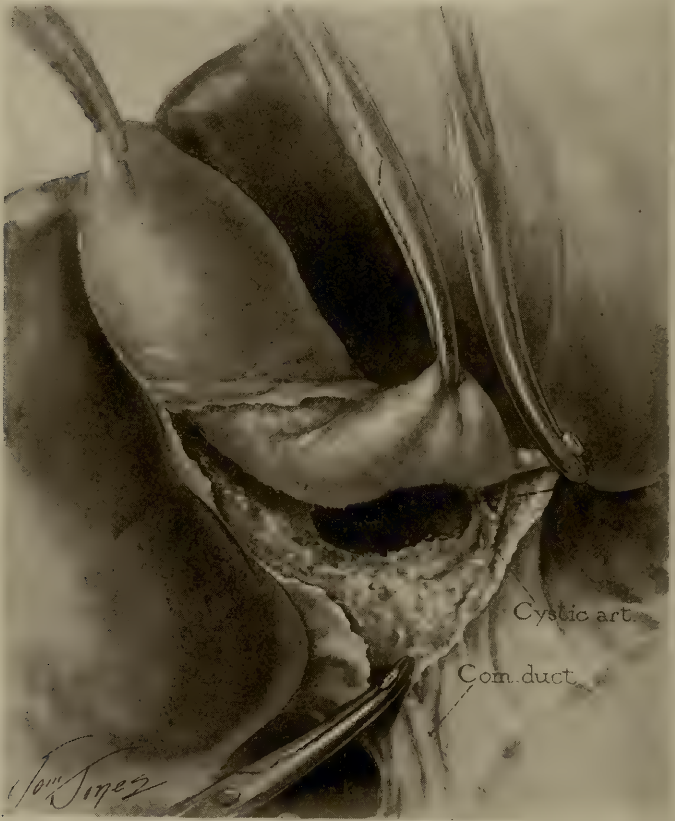

Fig. 462.—The cystic duct has been dissected out and cut, permitting the lengthening of the mesentery to the neck of the gall-bladder. This permits a more peripheral ligation of the branches of the cystic artery by cutting along the dotted line.

The cystic duct is now cut between two hemostats. Traction upon the upper one will partially enucleate the neck of the gall-bladder from the left and anterior peritoneal fold along which the branches of the cystic artery run. This forms quite a mesentery at this point and the several branches of the artery are plainly visible (Fig. 462). We will now catch this mesenteric fold with two hemostats, and cut it close to the neck of the bladder. At this point the cystic artery has divided into several branches, which I will ligate with a transfixion ligature so that it will not slip off. The field has been dry throughout, and we have avoided the danger region of the ducts and cystic artery by ligating the branches quite peripherally. The lower part of the gall-bladder is now entirely free, and we continue the freeing of the upper part as we would in the dissection from below up. There will be a little oozing here, as you see, from the anastomosing vessels to the liver, but it quickly stops. The stump of the cystic duct is doubly ligated with catgut. A few stitches approximate the excess of peritoneum left at the sides of the gall-bladder bed.

This original method of cholecystectomy (Fig. 461) is one that I have worked out while doing difficult dissections in order to avoid several well-known dangers.

There is less danger of injuring either normal or anomalous bile-ducts due to the dissection of the cystic from the gall-bladder neck down and ligation of the cystic branches peripherally.

There is less danger of hemorrhage from a torn or retracted cystic or hepatic artery, since the small branches are ligated peripherally and are quite intimately attached to the peritoneum.

In the presence of adhesions and in a difficult exposure I find that it is an easier as well as a safer method than the usual one from below up, and it avoids the hemorrhage and other dangers in the method from the fundus down.

I am going to leave a cigarette drain near but not against the stump of the cystic duct. Occasionally the cystic duct opens up, due usually to postoperative vomiting with increased bile pressure, and bile drains for from two to four days, when it promptly stops, without harmful effects. In closing the abdomen I am going to use several buttons, through which the silkworm-gut is tied for tension sutures well back on each side of the wound. I think that this method which Dr. Bevan has described is a very valuable aid in taking tension off of the wound margin.

Comment.—A diagnostic point that one may utilize from a carefully obtained history of infection in these patients is related to the chemical composition of gall-stones. It has been found by several investigators that calcium is present usually only in stones following an infectious process. This frequently is present only in the shell on the outside of a stone having a cholesterol nucleus, and is the result of a secondary infection. These stones show well on the roentgenograms. Thickened gall-bladders as the result of an old empyema and non-calcium stones may also show under certain conditions.

We can come nearer to putting the proper weight on negative roentgenogram evidence if we do not expect to see calcium stones on the films, following the careful study of the history of a patient, than if there is evidence of chronic infection. Some authors, as Aschoff and Bacmeister, believe that the combination of calcium on a nucleus of cholesterol is certain evidence of the entrance of infection following a stasis in the gall-bladder. Rarely has calcium been found combined in stones when the microscope and the clinical course showed no evidence of acute or chronic inflammation. There are two sources for calcium, since normal bile has been found to contain only a small amount of it. It may come from the mucin, which is rich in it, secreted from an infected gall-bladder mucosa. It may come in the exudate from the gall-bladder wall.

One problem that I have been interested in is that in which there are symptoms characteristic of gall-bladder disease, but at the operation the liver, gall-bladder, and other viscera appear normal.

The question at operation is whether there is stasis in the gall-bladder or whether it is slightly diseased, but requiring surgical interference. There may be a mild or quiescent inflammation, which may be proved easily by the microscopic examination. The objection to this method of determination is that if the gall-bladder is not at fault it should be left alone. The other condition that may be present is a mechanical factor, and is due to a stasis in the gall-bladder without infection or gall-stones.

There are a number of factors entering into the production of this stasis. Some of them are: changed intra-abdominal pressure resulting from pregnancy, an unusually short trunk and thick liver, obesity, the wearing of a corset, an abdominal tumor, prolonged bent posture from certain work; anatomic narrowing and thickening of the cystic duct; marked valve formation at the neck of the gall-bladder; ptosis of the gall-bladder or of attached viscera due to congenital or inflammatory bands; a muscular spasm at the outlet of the gall-bladder due to local or reflex stimulation; a physiologic stasis of bile due to improper food or to irregular meals; a lack of muscle tone due to a lack of exercise of the body, which may occur in middle age when habits change or obesity occurs; following the menopause in women when gall-stone symptoms are frequently aggravated; a change of metabolism of the liver and gall-bladder bile, and any mechanical obstruction below the cystic duct in or compressing the common duct, or at its outlet where spasm of the sphincter may be a factor.

The type of stasis which especially interests me is that in which there is a kinking or valve formation in the cystic duct or a spasm of the muscle at the outlet of the gall-bladder, giving symptoms of gall-bladder disease. That there is such a type of condition is evidenced by several factors. There are cases of mucostasis and intermittent hydrops described by Berg and others in which the cystic duct is patent, and in which there is no infection. There are cases reported from certain clinics in which after the gall-bladder has been removed it has been found microscopically to be without inflammation or pathology, but the patient has been relieved from symptoms.

There is a third group of cases, of which I have recently had several, in which the symptoms of mechanical obstruction and undoubtedly the gall-stones have developed in quite young women during or following soon after a first pregnancy. At operation I have found multiple small soft rough round stones, the liver appearing quite normal, and upon microscopic examination the gall-bladder has had no evidence of infection. In 2 patients I have recently operated the acute colic from gall-stones followed within eight days of delivery. One of these, a patient thirty-one years old, that I operated on last week, developed her first gall-stone colic on the eighth day after delivery from her first baby, when she first got up. She had experienced indefinite stomach disturbances during the pregnancy, so she stated, but they were not characteristic of gall-stones. I believe that the change in intra-abdominal pressure must have been a factor in the production of the attack; it is also probable that the increase in abdominal pressure was a factor in the development of the stones.

Changes in general body metabolism also occur during pregnancy and lactation. These factors may be aided by the local disturbances of circulation in the gall-bladder or of stasis due to a shifting or kinking of the ducts or blood-vessels as a result of any marked change in intra-abdominal pressure.

I believe that while we may have stone formation resulting later from mechanical factors we may have those same factors producing symptoms from gall-bladder stasis, without gall-stones. The actual part infection plays in stone formation with bile stasis is difficult to say, since with infection there may be secondary stasis due to inflammatory swelling. It is especially important to use all care in making a definite diagnosis in order to avoid operating on patients with conditions simulating gall-bladder disease. But in operating it is important not to leave a fairly normal appearing gall-bladder which is the seat of infection or stasis.

It is unnecessary to go into the complete differential diagnosis of gall-bladder disease, but I am going to mention two conditions not given their proper consideration. A common one is that due to inflammation or dilation of the kidney pelvis. The second is in salpingitis, in which upper abdominal symptoms may be prominent.

Since it is common to find a few leukocytes in a passed specimen in the normal female, and since in the male there is not infrequently a history of an old urethritis, one may easily overlook a pyelitis in which there are a small number of pus-cells or an intermittent discharge of pus in the urine. If in doubt, where there are a few pus-cells and the symptoms indefinite, I examine a sterile catheterized specimen of urine. If there is still any doubt about the kidney condition a cystoscopic examination and perhaps a pyelogram are made.

During the past month I have had 2 women patients come into the hospital with the diagnosis of gall-bladder disease. In one patient only a few leukocytes were found in both a passed and a catheterized specimen of urine. Here there was a moderate hydronephrosis shown by the pyelogram and a Staphylococcus albus infection in the right kidney pelvis. In the other patient there was a low-grade infection in the right kidney due to a Gram-positive coccus resembling a streptococcus. The left kidney in the first case had practically normal urine with only a few pus-cells as compared to the right side, while in the second the urine was normal.

These 2 cases could have been diagnosed gall-bladder disease without these tests, and operated unnecessarily, subject to all of the possible complications of such an operation. In addition to that, they came in with definite diseased conditions, which were relieved only by appropriate treatment.

I pointed out the occurrence of upper abdominal symptoms with the temporary diagnosis of cholecystitis in a case of pyosalpinx in the October, 1920 number of the Surgical Clinics of Chicago. I have repeatedly observed this pain, tenderness, and muscle rigidity in the abdominal region just lateral to the upper lumbar vertebræ and over the kidney pelvis, about which the lateral lumbar lymph-nodes are situated, in a moderately large number of cases of salpingitis.

The pain in the upper abdomen is on the side where pain and other evidence of salpingitis occur in the pelvis. In these cases there has been no evidence of a pyelitis and the symptoms subside parallel with the progress of pelvic inflammation. Similar symptoms develop on the other side with the onset of inflammation in the other tube. These symptoms in a few cases precede the pelvic symptoms a day or two; in others they follow the pelvic symptoms. Since upper abdominal symptoms may be the predominating ones in certain cases with pelvic inflammation, mistakes may be made where a good history is not obtained or a pelvic examination refused or unsatisfactory.

There may be several explanations offered for this upper abdominal symptom of pain with more or less localized tenderness and muscle rigidity, with infection in the fallopian tubes and perhaps also in the ovaries. It may be the result of an ascending lymphangitis and adenitis of the lateral lumbar lymph-glands, similar to a cervical adenitis following a throat infection. It may be a referred pain along a spinal nerve segment zone of the cord similar to the pain over the scapula in gall-stone colic. It may be due to the inflammation extending along the lymphatics to the kidney, the pelvis or ureter, with a certain amount of inflammation about them. It may be due to an extension of this inflammation to the regional lymphatics of the liver, pancreas or gall-bladder, or to these viscera.

The objection to the two latter theories is that the upper abdominal symptom parallels the evidence of pelvic inflammation, although it may precede the latter a day or two. In case the salpingitis is unilateral, the upper abdominal symptoms are unilateral, and with the development of inflammation of the other tube similar upper abdominal symptoms develop on the other side. The presence of confusing abdominal symptoms in this condition, as well as in many others involving extra- and intra-abdominal viscera, again emphasizes the importance of a thorough study of each individual case rather than a hurried laparotomy.

CLINIC OF DR. ROBERT H. HERBST

Presbyterian Hospital

URETERAL CALCULUS

A Case of Calculus in the Upper Portion of the Left Ureter. Treated by Injections of Sweet Oil. Delivered into Bladder by Incision and Dilatation of the Ureteral Meatus.

The first case which I wish to present to you this morning entered the Presbyterian Hospital complaining of a single symptom, viz., recurrent attacks of severe lumbar pain radiating to the suprapubic region.

At times it is difficult to determine the cause of pain in this region and to differentiate between intra-abdominal and retroperitoneal pathology. The most common retroperitoneal condition producing pain of this character is ureteral calculus. The cause of the pain in these cases is twofold: first, the obstruction to the urinary flow producing distention of the renal pelvis; and second, the descent of the stone along the ureter, with resulting trauma of the ureteral wall. The urinary obstruction plays the larger part in the pain production because the same type of pain, only less severe, is seen in other conditions of ureteral obstruction, such as stricture, blood-clots, kinking of the ureter, pressure of adjacent organs, etc. When a stone becomes lodged in a certain location the urinary flow from the kidney is either partially or completely blocked; this is followed by a sudden distention of the kidney pelvis and an increase in the intrarenal pressure.

Most ureteral stones are developed in the kidney, but do not produce pain until they are arrested in their descent to the bladder. Although a stone may pass from the kidney to the bladder without the knowledge of the patient, most of them are arrested and produce pain in the course of the descent.

The change in the location of pain as the calculus moves toward the bladder is often characteristic, beginning in the lumbar region extending along the course of the ureter to the end of the penis, testicle, and thigh of the affected side. Indeed, one may sometimes locate the position of a stone by analysis of the areas of pain and tenderness. Behan, in his excellent monograph on pain, calls attention to the pain areas produced by renal and ureteral calculi, and shows graphically the nerve regions traversed by a stone in its excursion from the kidney to the bladder. By a thorough study of the skin disturbance of the spinal nerves of this region the location of a stone may be determined. In addition, we have the zones of hyperalgesia of Head, which by careful observation may assist in the diagnosis.

Tenderness on deep palpation is often an aid in the diagnosis and location of a stone in the ureter; this may be found even in the latent periods.

Again, the skin of the scrotum on the affected side may be extremely sensitive to touch both during and between attacks of ureteral colic. The testicle may be drawn up toward the external ring.

The patient we have before us states that his attacks of pain are limited to the lumbar and suprapubic regions.

History.—His family history is negative except that one brother died of tuberculosis.

His past history is entirely uneventful, and even in regard to venereal diseases is negative.

Present Illness.—The history of his present complaint is not typical, but nevertheless suggestive. The first attack of pain began two weeks ago in the evening after the patient had eaten grapes. Shortly after the pain began an attempt was made to take a dose of magnesium sulphate, but he was unable to retain it, and vomited at once. The pain persisted all that night, but was not severe enough to keep him from sleeping.

Since the first attack the patient has experienced four others, the last one two days ago. At present he is free from pain.

He enters the hospital for examination and skiagrams.

Physical Examination.—The patient is a well-nourished man, forty-three years of age, not acutely ill.

Head.—The examination of the cranium is negative. The eyes react to light and accommodation. The nasal passages are patent. The teeth are not well cared for.

Neck.—There is no cervical adenopathy, and the thyroid is not enlarged.

Chest.—There is good expansion. The lung borders, excursion, and resonance are normal. No râles are present. The heart shows no murmurs, and the borders are normally located. Its rate is normal and regular. The first sound is dull and the second snappy. The pulmonic second sound is not accentuated.

Abdomen.—The liver and spleen are not palpable. The kidneys are both palpable. The palpable colon is not tender. There is tenderness in the left kidney region to deep palpation. This is present also along the course of the ureter on this side. No hernias are demonstrable.

Extremities.—The patellar reflexes are present and equal. Plantar reflex is present and sluggish. The abdominal and cremasteric reflexes are present and equal.

Laboratory Findings.—Blood-pressure: Systolic 118, diastolic 70, pulse-pressure 48.

Leukocytes per c.mm., 11,700; hemoglobin, 80.

Urine: Spontaneous sample, cloudy; amber color; acid; nucleo- and serum albumin negative. Sugar, trace on cooling. Micro.—few epithelial cells; erythrocytes, 1 plus; leukocytes, 1 plus; amorphous urates.

On admission: Temperature 98.8° F., pulse, 80; respirations, 20.

Slight temperature in evening, never, however, rising above 99.2° F.

Pulse range: 56 to 88.

Respiration range: 16 to 20.

Cystoscopy.—This examination revealed the entire bladder wall slightly injected, cystitis 1 plus. Bladder otherwise negative. The left ureter was difficult to catheterize due to small ureteral orifice. Finally we succeeded in passing a No. 4 shadowgraph catheter, which was stopped at a point 11 cm. from the ureteral orifice.

x-Ray Film.—Kidney shadows are unusually large, but may be normal for this patient. The right kidney extends to the upper border of the fourth lumbar vertebra, the left kidney to the transverse process of the third lumbar vertebra. On the left side the shadowgraph catheter extends to the lower border of the sacro-iliac joint. Immediately above the catheter tip is a small round dense shadow, probably a ureteral calculus, obstructing the further passage of the catheter. No other evidences of calculus are to be seen. No evidences of bone changes are noticed.

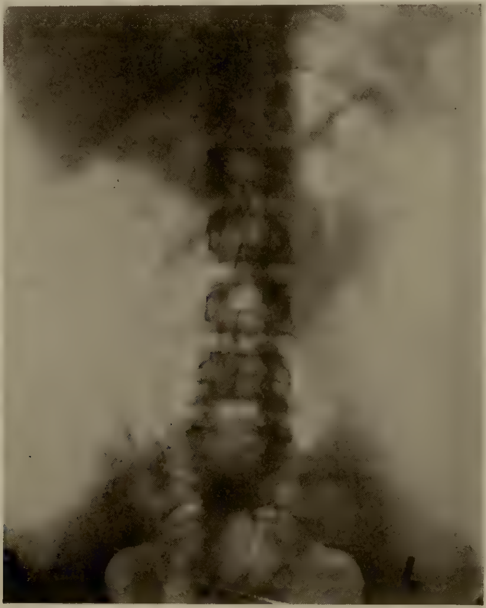

Fig. 463.—Calculus opposite lower border of the fourth lumbarvertebra.

x-Ray Film Five Days Later.—The small round dense shadow previously seen at the lower end of the sacro-iliac joint is now plainly to be observed just below the level of the ischial spine. The other findings are the same as previously noted.

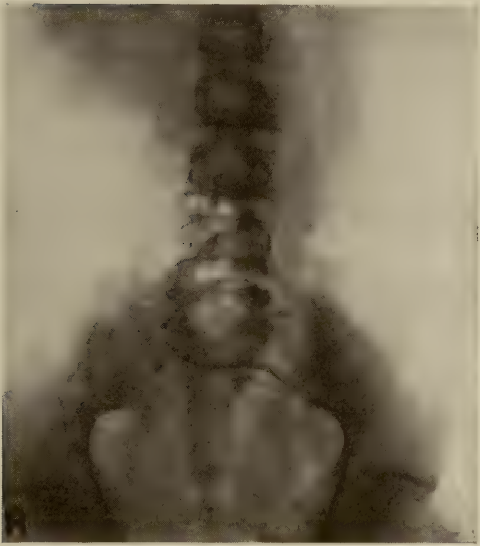

Fig. 464.—Calculus opposite upper border of the fifth lumbar vertebra.

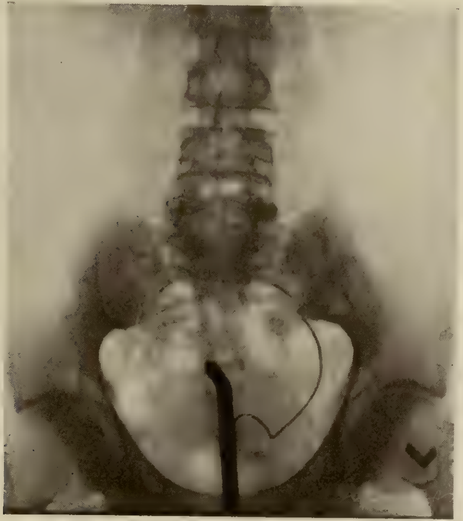

Fig. 465.—Calculus at the crest of the ileum.

From these findings it is evident that this patient is suffering from a ureteral stone.

Following the first cystoscopic examination and the first *x*-ray two injections of sweet oil (5 c.c. each) were made into the left ureter, and judging from the location of the shadow in a film taken five days ago we have succeeded in moving the calculus to the lower extremity of the ureter (Fig. 466). However, in a film taken today the stone is seen in the same position as it was five days ago; it is probably impacted in the mural portion of the ureter. The small ureteral orifice found on previous cystoscopic examination is probably preventing the stone from passing into the bladder. The paroxysmal pains have been very severe for the last few days, so I shall attempt to assist the passage of this stone by cutting the lower end of the ureter.

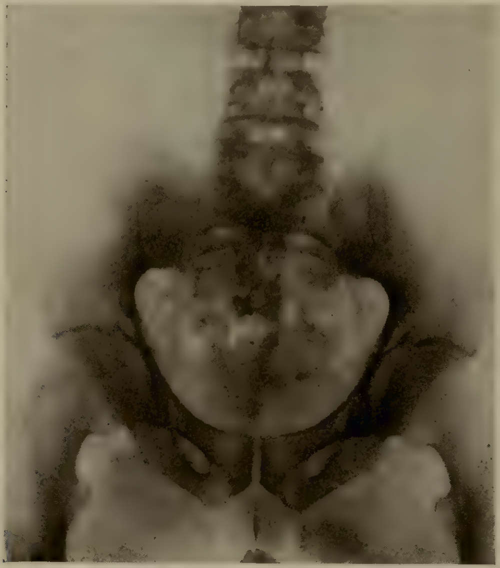

Fig. 466.—Calculus impacted in the lower end of the ureter.

Operation.—The urethra has been anesthetized by the instillation of 2 drams of ½ per cent. solution of cocain and the bladder irrigated with warm sterile water. I will now pass the operating cystoscope into the bladder. The left ureteral orifice, although small, is gapping open and the bladder wall, 1 cm.

above it, is bulging. It is evident that the orifice is too small to allow the passage of this stone. I will now pass these scissors through the cystoscope into the upper angle of the left ureteral orifice and make a cut about 1 cm. in length (Fig. 467). I can now see the calculus engaged in the enlarged opening, and by pressing on the bladder wall above it with the end of the scissors I have succeeded in forcing the stone into the bladder.

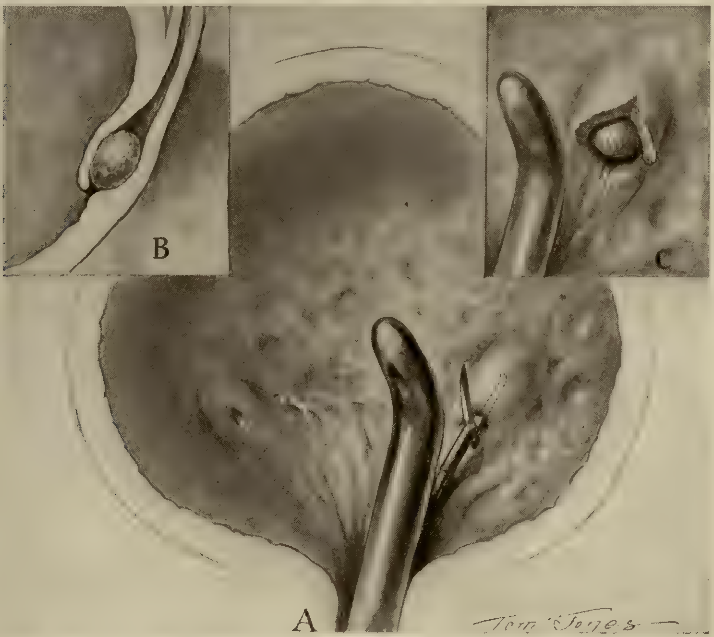

Fig. 467.—B, Calculus caught behind ureteral orifice. A, Cutting lower end of ureter with cystoscopic scissors. C, Calculus presenting through cut ureteral orifice.

I will remove the cystoscope and inject 2 ounces of sweet oil into the bladder to assist the patient in passing the stone from the bladder.

Note.—Two hours later the patient passed the stone in voiding without much discomfort. It is rarely necessary to crush a ureteral stone after it has reached the bladder. Most of them will pass through the urethra with the assistance of oil left in the bladder.

With our present-day methods of diagnosis few ureteral stones escape detection. Many are found by the *x*-ray and localized with the shadowgraph catheter. Those which fail to produce a shadow on the film may be found with the wax-tip catheter or the shadow intensified by the injection of a contrast fluid into the ureter before taking the film.

Treatment.—Over 50 per cent. of renal stones which engage in the ureter will pass spontaneously, and a large proportion of those which become arrested can be assisted by cystoscopic manipulations. Dilatation and lubrication of the ureter will aid the passage of many of these stones into the bladder. In those cases in which these methods fail and the stone is impacted in the lower extremity of the ureter its delivery can be easily accomplished by cutting the meatus through the operating cystoscope. This incision may be carried up for a distance of 1½ cm. with safety. In most cases the cutting of the meatus is all that is necessary. The incision usually heals in a few days without contraction and stricture; however, if this occurs, dilatation with ureteral bougies should be practised.

PAPILLOMA OF PROSTATIC URETHRA, TREATED WITH RADIUM AND FULGURATION

The patient, who is sixty-two years old, enters the hospital complaining of painful emissions and bloody semen.

Past History.—He has had the usual diseases of childhood. Otherwise he has been free from disease. He denies venereal diseases.

History of Present Complaint.—Seven or eight years ago he experienced pain at the time of seminal ejaculation. This pain was more severe when the ejaculations were several weeks apart than when they were more frequent. The pain became so marked that intercourse was discontinued.

Spontaneous emissions were likewise painful.

Last March, about five months ago, he noticed blood in the seminal fluid on two or three different occasions. For this he consulted a physician.

He has never had any urinary symptoms, and states that the urine has never been stained with blood, but red blood-cells have been found a number of times on examination.

Family History.—Father and mother died by drowning. One brother died at fifty-five years of age from an accident. Two sisters died in infancy. There is no history of tuberculosis in the family.

Physical Examination.—The patient is a well-nourished man of sixty-two years of age of about 150 pounds weight, and 6 feet in height.

Head.—The ears, nose, and throat are negative. The mouth is negative except that several teeth are missing.

Neck is negative.

Chest.—The chest, lungs, and heart are negative.

Abdomen.—The abdomen, liver, spleen, and kidneys are negative.

Extremities negative.

Genitalia externa negative.

Lymphatics negative.

Reflexes all normal.

Temperature varies from 97.6° to 99° F.

Respiration varies from 18 to 20.

Pulse varies from 82 to 88.

Blood-pressure (Tycos): Systolic 134, diastolic 88.

On second admission:

Blood—Leukocytes, 8900; hemoglobin, 85. No plasmodium malariæ.

Urine: Clear, acid, no sugar or albumin.

No casts, bile, indican, or crystals, a few red blood-cells were found.

Leukocytes 68 per cubic millimeter.

Catheterized bladder specimen: 68 cells per cubic millimeter.

Culture—no gas, no T. B. in direct smears.

Cystoscopic examination reveals a normal bladder.

On rectal examination the prostate gland and seminal vesicles were found to be normal, and *x*-ray of the prostatic region did not show any calculi.

The symptoms of which this patient complains would cause one to think of an inflammatory process involving the seminal vesicles, the prostate gland, or both. Particularly would one think of tuberculosis, of a neoplasm developing in one of these organs, or of a neoplasm of the prostatic urethra. Stone of the seminal vesicle or prostate may also produce bloody semen and painful ejaculations.

The more common symptoms of growths of the posterior urethra are frequency imperative urination, difficult urination to the point of complete obstruction when the growth is large. To these may be added the symptoms of which our patient complains, viz., painful ejaculation with blood-stained semen.

By means of the water-dilating straight urethroscope three papillomata were found. These appeared to be rather typical papillomata differing in structure from the more common polypi found in this region, which are usually small pedunculated growths resulting from long-standing infection. However, these appear to be true papillomata resembling the common growth found in the bladder, but rarely seen in the urethra. Two were found attached to the left side of the internal urethral orifice, the other on the floor of the prostatic urethra 1 cm. in front of the internal urethral orifice.

Radium (25 mg.) in a tube attached to a staff, screened with 1.4 mm. of gold, and a rubber capsule, was inserted into the prostatic urethra. This was left in place for seven and one-half hours—a dosage of 187.5 mg. hours.

The patient left the hospital the next day.

Urethroscopic examination: On readmission to hospital (11/24/21), three months and fourteen days after the first treatment, the growths were found unchanged.

Radium (25 mg.) was again inserted into the posterior urethra, and left in place for eight hours—a dosage of 200 mg. hours. The patient left the hospital four days later.

Urethroscopic examination on readmission to hospital the third time on April 20, 1922, about five months after the last treatment: By means of a cysto-urethroscope two small papillomata were seen hanging from the left border of the internal urethral orifice, also a large growth was found on the floor of the prostatic urethra.

From these findings it is evident that the radium exposures did not have much influence on these growths.

Owing to the age of the patient and the papillary type of the tumors one would have to consider the possibility of malignancy, and, with this in mind, we made the two applications of radium.

Today we are going to try to destroy these tumors with the high-frequency current applied through the cysto-urethroscope.

For diagnostic purposes the straight water-dilating urethroscope is most useful because it gives the operator the opportunity to observe the entire circumference of the urethra in one field while the cysto-urethroscope gives only a limited field. However, it is difficult to direct the fulgurating electrode to the tumor through a straight tube, but by using the directing arm of a cysto-urethroscope one is able to apply and control the point of the electrode more accurately.

I will now introduce the beaked cysto-urethroscope into the bladder, turn on the water, and by gradually withdrawing the instrument I can now see the two growths which are situated on the internal urethral orifice. I will apply the electrode to them and turn on the current (Fig. 468). The tumors are promptly blanched wherever the electrode touches them, and by moving the electrode from time to time I have succeeded in destroying these growths. We will now draw the instrument outward and turn it slightly downward, which brings the tumor situated on the floor of the urethra into view. We will again turn on the current and destroy this growth. I will now remove the instrument, and you note that there is practically no bleeding. The entire operation has been painless, owing to the instillation of 3 c.c. of ½ per cent. solution of cocain into the posterior urethra just previous to the introduction of the instrument.

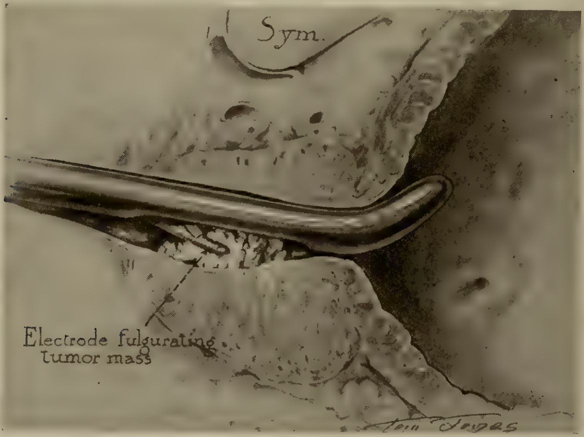

Fig. 468.—Destruction of papilloma of the posterior urethra with fulgurating electrode.

This patient will be observed from time to time. If the growths have not been entirely destroyed, or new ones develop, the operation will be repeated.

Discussion.—Polypi are often seen in the urethra, while papillomata are rare in this location. The latter may be benign or malignant. Urethral growths are usually small, but may at-tain a size which produce obstructive symptoms. They are usually the result of prolonged irritation to the mucosa by long-standing chronic infectious processes. As a rule they appear in the posterior urethra about the verumontanum and in the region of the internal sphincter of the bladder. Those near the verumontanum are associated commonly with sexual and neurasthenic symptoms and blood-stained semen, while those at the bladder neck are connected with urinary disturbances, such as frequency, dysuria, and hematuria. The benign growths may be removed with a snare, but are more effectively destroyed by fulguration, and where malignancy is suspected the treatment should be supplemented with radium.

CARCINOMA OF THE BLADDER. TREATED BY RADIUM NEEDLES INSERTED INTO THE TUMOR MASS THROUGH THE VAGINAL WALL

Present Complaint.—The patient entered the hospital complaining of intermittent attacks of hematuria, frequent and difficult urination, dysuria, and a feeling of pressure in the lower abdomen.

Family History.—Father died of "some abdominal trouble" at eighty years of age. Mother died of carcinoma of the uterus at fifty-two years of age. One brother killed at eleven years of age, and another killed in the recent war, and yet another died in infancy. Husband died at eighty years of age of pneumonia. Four children are living and well, and 3 died; one of pneumonia, 1 of flu and pneumonia, and 1 of some fever.

Previous History.—She has had the usual diseases of childhood. Pneumonia one year and three months ago, gall-stone attacks three years ago. No surgical procedures. The menopause occurred at forty-five years, and no uterine bleeding since.

Onset and Course.—A feeling of pressure in the lower abdomen began four months ago. This pressure was relieved at first by urination and lying down, but during the last ten days has become a constant bearing-down feeling unrelieved by anything, more severe than formerly, and growing worse. She describes it as "something pressing on the mouth of the bladder."

Hematuria began about three months ago, and appeared at intervals of three or four weeks during the first two and a half months. Since November 29, 1922 the bleeding has been constant, appearing with nearly every urination. The bleeding occurs at the start and during the course of the voiding. Clots have appeared during the past ten days, becoming gradually larger and more numerous.

Frequency of urination has been present for many years, averaging six to seven times diurnally and three to four times nocturnally. Since the onset of her present trouble about four months ago the frequency has gradually become worse, until now she micturates at times every ten to fifteen minutes nocturnally, and almost as frequently during the day.

Difficulty in urination began three months ago. This consists in difficulty in starting the act, and it is steadily becoming worse. When a clot of blood passes the urinary stream is interrupted and considerable pain is felt until the clot is delivered.

Burning pain during voiding has been present for years, and is not any worse now than formerly.

Examination.—A fairly well-nourished, anemic woman seventy-three years of age. A widow. During the past six months she has lost 15 pounds in weight.

Head.—Head and neck negative. Eyes, ears, and nose negative.

Chest.—No cough, lungs negative. Some dyspnea on exertion, and some swelling of the feet when she is up and about. There are occasional attacks of palpitation and dizziness.

Nervous system is negative.

The *osseous system* is negative.

Gastro-intestinal system is negative.

Mouth.—Several teeth in lower tier with amalgam fillings and several missing. No pyorrhea. Plate above. Tongue and pharynx negative.

Heart.—Not enlarged. Soft systolic murmur heard at apex and not transmitted. No arhythmia.

Abdomen.—Walls thick and flabby, with striæ abdominalis present over lower half. No rigidity, no masses palpable. Slight tenderness over umbilical and hypogastric regions. Pressure in hypogastrium to left of midline creates the sensation of desire to urinate. There is some tenderness on deep palpation over the right flank.

Spine negative.

Extremities negative except for slight edema of both ankles.

Reflexes present.

Skin negative.

Rectal examination (bimanual): A hard firm mass palpable through anterior abdominal wall.

Vaginal examination: A hard, smooth, rounded, elongated mass is felt projecting into the vagina anteriorly on the right side. It can be felt through the abdominal wall to a height of three fingers above the symphysis. It is but slightly mobile.

Cystoscopy reveals a large tumor involving the right side of the bladder, extending from the vertex to within 1 cm. of the internal urethral orifice. On the surface of the tumor there are areas of necrosis some of which are covered with incrustations. This tumor is undoubtedly malignant.

By vaginal palpation during cystoscopy a mass is felt corresponding to the area involved in the bladder, and protruding well into the vagina. It is about as large as a small hen's egg. The vaginal mucosa is intact.

Laboratory Findings.—Blood, December 5, 1922: Leukocytes per cubic millimeters, 15,000; hemoglobin, 65. Blood-pressure, systolic 202, diastolic 102, pulse-pressure 100.

Urine (December 5, 1922): Spontaneous specimen, cloudy, pink color, alkaline, serum albumin 2 plus. No sugar, no casts, few epithelial cells and leukocytes. Blood test 2 plus (benzidin).

Feces, spontaneous: Watery, gruelly, no blood, pus 1 plus, mucus 1 plus.

Temperature range 98.4° to 99.6° F.

Pulse range 76 to 96.

Respiration range 18 to 20.

This rather large tumor found in the bladder of our patient has apparently remained within the limits of the bladder wall. It can be readily palpated both through the rectum and vagina. On cystoscopic examination it appears to involve about one-half of the right posterior lateral wall of the bladder. It is papillary in type and shows several areas of necrosis. The bladder wall surrounding the tumor is edematous. These findings are significiant of malignancy and we evidently have to deal with a papillary carcinoma of the bladder.

Bladder tumors rarely invade the surrounding structures and remain confined to the cavity of the bladder for a long period of time. Metastases, as a rule, appear late and develop in the abdominal viscera, spreading by way of the pelvic lymphatics. Cases of metastases from bladder tumors have occurred in remote organs, but such metastases are comparatively rare and occur late.

There is one dominating symptom which should always be investigated by cystoscopic examination without delay, viz., hematuria, especially of the intermittent painless type. This patient noticed blood in her urine over three months ago, but she did not seek help until pain and frequency of urination became unbearable.

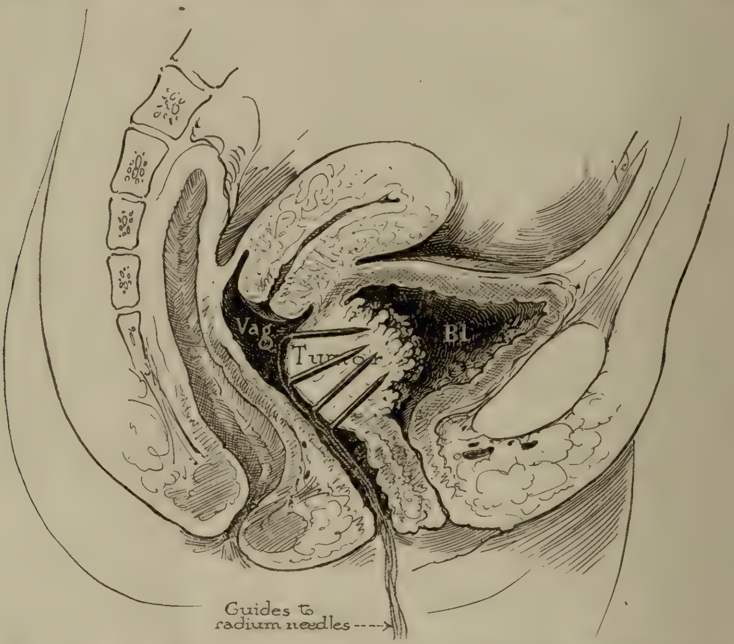

Fig. 469.—Shows radium needles inserted into tumor mass through anterior vaginal wall.

Treatment.—After a careful general physical examination we have not been able to determine any metastasis. The tenderness found in the right flank is probably due to a moderate degree of hydronephrosis produced by pressure on the lower end of the right ureter by the tumor. On cystoscopic examination the right ureter did not appear to be involved, but the growth extended well up to the ureteral orifice, evidently producing some obstruction to the flow of urine from the right kidney.

Excision, short of complete cystectomy, cannot be carried out in this case because the tumor extends well up to the internal urethral orifice. However, its location makes it easily accessible to irradiation through the anterior vaginal wall, in fact, the entire mass can be outlined through the vagina. Radium needles can be introduced directly into the base of the tumor through the anterior vaginal wall, giving an excellent opportunity for destruction of the tumor.

Operation.—I will infiltrate the anterior vaginal wall with $\frac{1}{2}$ per cent. novocain solution. By using a deep vaginal retractor we are able to introduce the radium needles through the anterior vaginal wall directly into the base of the tumor without any difficulty. We are placing these needles about 1 cm. apart, and you will note that it has required four needles to cover the area (Fig. 469). These needles all contain $12\frac{1}{2}$ milligrams of radium and are screened with 3 mm. of steel. They will be removed in twelve hours, giving a dosage of 600 milligram hours. The time for repeating this treatment will depend upon the amount of local and general reaction following this exposure.

I will now introduce a cystoscope to determine the position of the needles in relation to the tumor. The points of the needles cannot be seen protruding into the lumen of the bladder and evidently are well embedded in the tumor mass.

Postoperative Note.—The patient did not experience any local or general reaction and the vaginal mucosa was not disturbed by the radium. Ten days later the treatment was repeated.

One month after the first exposure: The tumor is greatly reduced in size, hematuria has almost entirely ceased, and micturition is easier.

CLINIC OF DR. KELLOGG SPEED

Presbyterian Hospital

COMPRESSION FRACTURE OF THE DORSOLUMBAR VERTEBRÆ. PATHOLOGY AND TREATMENT

Pathology of Compression Fracture of the Dorsolumbar Vertebræ. History and Autopsy. Report of Two Cases. Treatment.

Compression fracture of the dorsolumbar vertebra involves primarily the corpus of the vertebra. All concomitant pathology involving the other portions of the bony spine, the ligaments, and the spinal cord is secondary to the changes in the bodies of the vertebræ involved, or can be classed as secondary in point of time at least. They may, however, assume primary importance, for, as in skull fracture, the bone lesion is relatively insignificant from a prognostic standpoint; the amount of damage to the central nervous system remains paramount. The exception in the spine is its change of weight-bearing power and flexibility. The amount of injury to the cord or its nerve prolongations has the greatest influence on the patient's future. Yet the structural injury of the bony spine with its ligamentous and muscular attachment must first attract our attention in a basic study of this injury.

Although roentgenographic study of bone architecture as applied to the diseases of bone or fractures has yielded progressive information and broadened both our ability to diagnose lesions of bone and our understanding of bone pathology, it seems that in fracture reports we are coming to lean too much on the rayed findings. There is still something to be gained from gross pathologic or microscopic examination of broken bones, a correlation between unrecognized and faint roentgenographic findings must be made with real structural and pathologic conditions, so that our interpretation of roentgenograms becomes reliable.

Compression fractures of the spine are being recognized as of frequent occurrence. Probably the old preponderating ratio of fractures of the spinous processes compared to other parts of the vertebræ will soon be upset when new fracture statistics are compiled. Such new statistics will be based on exacting examination of all back injuries, coupled with interpretations of *x*-ray findings, now so distinct, unlike those of a few years ago.

The bodies of the vertebræ, locked together by their laminæ and transverse processes, steadied by the ribs and spinous processes and their attached muscles and ligaments, and finally tied together by the interspinal ligaments bear the burden of body weight. With the aid of interspinous cartilaginous disks they take up most of the rude shocks. The curves of the spine, cervical, dorsal, and lumbar, aid in this process. All compression fractures are caused by an exaggeration of the normal curves of the spine and must be the result of hyperflexion. This flexion may be the result of a fall from a height, a sudden superbending of the back, as in driving under a low door, or the same position forced by sudden trauma. Because the vertebral bodies sustain the body weight they must be compressed by this flexion. If the action of hyperflexion is slow and yet ponderous without axial deviation of that portion of the spine above the site of maximal flexion, then the body or bodies affected are compressed. The vertical diameter of the corpus is lessened without displacement of bone in any direction and the cancellous bone of the corpus simply becomes denser. If, however, the hyperflexion is accompanied by axial deviation of the spine above the dorsolumbar region, as from a twist or side shove, then one side of the vertebral body may be compressed more than the other, resulting in an increased narrowing of the compressed side, while the opposite may remain in normal shape. Rarely two lumbar vertebræ are simultaneously compressed and there may be one or more normal vertebræ between the two injured.

Should there be also a sudden jarring application of the force, the vertebra lying at the apex of the rapidly formed hyperbend of the spine may be sheared off through the cancellous body. Consequently, the portion of the body thus sheared off is displaced, and always in the direction taken by the causative force. The upper or mobile portion of the spine moves with it to change axial relation to the lower and fixed portion. A law may be expressed that in compression fractures of the vertebral bodies with displacement, the upper fragment moves forward and sometimes lateralward as well, and the upper segment of the spine is always displaced forward with it. We have then displacement, and its consequences are far reaching, but are after all secondary to this mechanism. As the upper portion of the spine moves forward and flexes, there must be a partial unlocking of the intimate articulating relations of the vertebra just above the fracture and the one involved in the fracture. This leads to luxation and possibly to fracture of the laminæ or, rarely, the transverse processes, and as the displacement occurs some ligaments must be rent asunder. In this moving forward and bending or tilting the spinous process of the vertebra just above the fracture tends to change its angle, becoming more prominent beneath the skin of the back to form a gibbus. Also, as the upper vertebra moves forward retaining its normal axial bony and ligamentous relation with all other vertebræ above it, its arches and laminæ approach near to the corpus of the injured vertebra below and thus narrow the spinal canal, encroaching on the space supplied for the cord. This displacement may be so great that the cord is pinched completely in two.

When the pressure of bone affects the cord, pressure necrosis and hemorrhage within it follow. Concussion of the cord simulating complete severance is seen. If the hemorrhage is extradural, it is of little moment and promises to be absorbed. Hematorachis is not necessarily fatal, nor does it frequently cause permanent symptoms. Hemorrhage beneath the dura and in the substance of the cord is of greater import. It is called hematomyelia and may spread up and down the cord for several inches. The pressure of this hemorrhage may lead to the death of axis-cylinders or of the cells in the anterior horn. Occasionally it is central in character, and when cysts form later from the extravasated blood a condition resembling syringomyelia results, with loss of pain and temperature sense in the region involved.

When nerve-cells and axis-cylinders are destroyed their regeneration within the cord probably never occurs. If the axis-cylinder or cells are compressed by hemorrhage or exudate relief of that pressure not too long delayed may restore the nerve-fibers to function.

I firmly believe that all the bone displacements in compression fracture, as of the vertebral body and its component parts, take place at the time of injury. Whether the cord is damaged by pressure or hemorrhage or goes free matters little to bony repair. When no cord symptoms follow the injury and the patient in a short period becomes ambulatory or tries to work, there is no great increase in the bone deformity and displacement, because a process of repair and of callus formation starts immediately as in any fracture. The cancellous tissue of the vertebral corpus lends itself to early and sufficient callus formation to bolster up the defect caused by the injury. Its blood-supply is rich and is never totally destroyed, even when the bone is strongly compressed. Nevertheless, it is clinically observed that when a patient is thus injured and presents no immediately noticeable gibbus, after several weeks or months of weight bearing the spine tends to give more and more. A well-defined gibbus results, cord pressure appears, and it has been thought that the bone of the corpus gradually absorbed to weaken and permit the further bending of the back. In 1895 Kuemmel, in his description of 5 cases of osteitis of the spine, while acknowledging that trauma was a factor, felt that he had discovered an undescribed condition. That was in preroentgenologic days, and yet today there are practically no instances of these back injuries recorded where successive Roentgen exposures of the spine have been made which might demonstrate a gradual absorption and shrinking of the corpus. Those patients which come to us are already well advanced in their gibbus formation, or if received soon after injury are given treatment which precludes weight bearing with secondary deformity.

I consider that the increase in angularity of the spine is largely contributed to by the giving of the various ligaments which were traumatized at the time of injury. The condition is much different from tuberculous spondylitis when the vertebral body disintegrates, softens, and changes shape from pressure, but does so with intact ligaments. Following trauma which results in compression fracture the ligaments if torn must give when the patient continues weight bearing.

During these secondary changes exostoses often develop from the vertebral body. A sudden secondary jar some time after the original injury may complete the forward dislocation of the upper spinal segment and suddenly sever or press upon the cord with paralytic results. These complications are seen after osteopathic and chiropractic "adjustments." The final stage is one in which the compressed and shattered vertebral body resuming its weight-bearing function with renewed blood-supply, callus formation, strengthening of ligaments, and changes in articular facets comes to a resting stage, where no further angulation results. This may be without gibbus formation if the body has been uniformly compressed and given a chance to heal. Usually it ends with a gibbus, and after a long period—two to five years—pain disappears.

Secondary pathology with its manifesting symptoms appears immediately after bone and cord injury. If the cord has been severed, there follows complete motor and sensory paralysis of all parts whose supply lies at the level of or below the fracture. Primary cord shock, edema, or even hemorrhage may simulate complete severance, but these conditions tend to improve as normal circulation is re-established or pressure is removed. The muscles begin to atrophy in their flaccid condition, blood-vessels dilate, skin sweats, and the slightest trauma or prolonged pressure, as of lying in one position, produces painless areas of pressure necrosis. These areas lack vitality, infection progresses rapidly in them, and even the most meticulous care may fail to cure them.

More important than these muscle changes are the paralyses of bladder and rectum. The rectal sphincter, in a lesion of complete destruction of its nerve supply, becomes relaxed, the anal mucosa pouts out as in a prolapse, and feces dribble away without the patient's knowledge or pain, a veritable incontinence. If the rectal center in the cord is without the area of damage, the local reflex arc of the anal sphincter may be intact, and freed from impulses arriving from above, the condition may result in a spasm of the anal sphincter with retention of feces.

While the anal disturbance is trying and calls for constant nursing attention, it has relatively less importance than bladder disturbance. When the bladder center is concerned directly or even by proximity to the cord lesion, its sphincter tends to become spastic, and as control is lost, the bladder cannot empty itself by opening its outlet. The patient retains his urine, frequently without pain, and is unconscious of this accumulation. The bladder enlarges, becomes an abdominal organ, and shows as a tumor mass above the pubes. Even that does not worry the patient much, but, unfortunately, it does worry his friends, and particularly his medical adviser. If the bladder were permitted to enlarge, eventually the pressure within it aided by hand pressure above the pubes would overcome the sphincter guard, and urine would begin to dribble away through its natural passage. Thus would be established an incontinence of retention which would slowly and continuously drain off the retained urine. This distention is accompanied by some dilatation of the ureters and the pelves of the kidney, but is comparatively innocuous. A bladder in this condition does not burst. The patient may gradually regain some bladder control and be able to reduce the amount of residual urine to a very few ounces. That is a bearable condition and is strongly contrasted to what usually happens.

The friends or medical attendant become alarmed at an absence of urine. The catheter is resorted to and infection follows. No matter how carefully catheterization is performed, infection is surely introduced usually the very first time, and not to a *normal* bladder, but to a paralyzed and distended one.

Resistance is low, urine is stagnant and retained, and rapidly a severe cystitis followed by an ascending infection with pyelitis and pyelonephrosis develops, with death from kidney abscesses or destruction. This death is not unfailing, for men have lived for years with these kidney infections, but the average individual with a clean genito-urinary tract rapidly succumbs.

When incontinence of retention is secured, emptying of the bladder may be encouraged by use of the abdominal muscles, if unparalyzed, or by gently stroking the inner side of the thighs to obtain a mass reflex and emptying of the bladder by sphincter relaxation.

The usual cause of death after compression fracture of the spine with cord symptoms is infection of the urinary tract with or without perinephritic abscesses and peritonitis. Pressure sores, leading to terminal metastatic foci, may be the cause, or rarely venous thrombosis and embolism.

The history following, with descriptions of two autopsies given in detail, illustrate the pathology and lead to a discussion of the treatment, especially treatment of those patients who suffer cord symptoms at the time of injury.

A thirty-eight-year-old man was injured while driving his automobile on July 2, 1922, when he was forced into the ditch and his motor was overturned. His back was injured so that he had complete sensory and motor paralysis from the waist down. His rectal mucosa pouted out of a distended anus and he passed no urine. A gibbus was found at the twelfth dorsal and first lumbar vertebræ. Within twenty-four hours I performed a laminectomy extending from the eleventh dorsal to third lumbar vertebræ and exposed a compressed and angulated cord. The twelfth dorsal spine was rotated to the right and the whole vertebra was dislocated forward, so that the cord was pinched between the arches of the twelfth dorsal and the body of the first lumbar vertebræ. The dura of the cord seemed unruptured. There were some extradural clots and hemorrhage, but the cord did not bulge beneath the dura as if it were full of blood. Rather it was felt to be pinched. All bony pressure was removed and the wound was closed with a capillary drain.

The patient was placed on a water-bed. Two days later, the bladder not having started to empty itself, the attending doctor catheterized him and obtained 56 ounces. This contained some pus-cells on microscopic examination. Within two more days tactile sensation returned in his legs to nearly the ankle, he passed a large involuntary bowel movement, and the anus seemed less pouting. Inasmuch as the bladder still refused to empty itself, and it was felt that he may have had some cystitis or urethritis at the time of injury, a retention catheter was introduced into the bladder to keep the urinary tract completely drained. The bladder was washed out daily with boric acid solution and some 10 per cent. argyrol solution was always left in the bladder after the irrigation. Three weeks later he was transferred to the Presbyterian Hospital and this same type of treatment continued. He had a water-bed, excellent nursing attention, and daily massage of his paralyzed limbs. Sensation never quite reached his toes, but he became able to flex his thighs and move the calf muscles slightly.

After a few weeks, the urinary tract remaining aseptic, his catheter was removed for periods of eight to twelve hours at a time to see if bladder function could not be encouraged to return. There never was much gain, however. About this time a small burn occurred on one buttock when he was left sitting on a hot-water bag in an effort to induce urination. This was slowly healing with some infection.

The patient was now allowed up in a wheel-chair and a special movable frame was built in which he could be lifted and allowed to bear weight on his feet and exercise his leg muscles. Into this he was put daily and with the help of 2 orderlies was walked about on crutches.

Nearly three months after injury he developed a sudden chill, with temperature rise and edema in one leg. His exercise and wheel-chair privileges were stopped and massage was interdicted. The urine remained normal during this time. Slowly the leg swelling improved and within a few weeks he was again encouraged to be up. After a short period the opposite leg suddenly underwent the same type of swelling accompanied by a chill and fever, so that he again was confined to bed. About three weeks before death, which occurred on December 3, 1922, he developed sharp pain in the left side of his chest, accompanied by some dyspnea and pain over the kidney region on deep inspiration. Kidney infection was considered, but the urine still showed no untoward findings, and a tender organ was not palpable. A few râles were found in his chest, but no dulness; later some pleuritic rub manifested itself. His condition gradually became weaker, and he passed away with marked dyspnea and cyanosis, the leg swelling remaining and the chest finding being still undiagnostic. We believed that he had a thrombosis of the thigh with pulmonary infarct.

Autopsy: Anatomic diagnosis, Traumatic fracture dislocation of first lumbar vertebra, compressed spinal cord. Thrombosis of right common iliac vein, diffuse hemorrhagic multiple infarcts of lungs with passive hyperemia and edema, localized fibrinous pleuritis, anasarca of right lower extremity, solitary left kidney, acute simple cystitis, ureteritis, and pyelitis (slight reddening of lining, old process), thrombosis of branch of renal vein, hypertrophy of the bladder, marked hyperplasia of the spleen, fatty changes in liver and kidney, lessened yellow material of the adrenal cortices, urunculosis of buttock, laminectomy scar, some long since absent teeth. Much of the remaining description of the autopsy findings are omitted because they have little bearing on the subject in hand. A portion of the spinal column (Fig. 470, A) was removed. It consisted of an area from tenth thoracic vertebra to the fourth lumbar inclusive. A distinct slipping forward of the twelfth thoracic vertebra was noticed. The middle of the body of the first lumbar vertebra presented a deep encircling furrow running at a right-angled plane to the long axis of the spine. At the lower part of the furrow-like constriction there was rough irregular bone, and on the right side close to the transverse process there was a hard projection of new bone formation which extended half-way up on to the twelfth thoracic vertebra and for at least 2 cm. to the right. That portion of the spine above the lumbar vertebræ formed an angle of about 5 degrees with the lower portion because of a sudden angular bend to the right at the junction of the thoracic and lumbar portions. When the spinal canal was opened the cord was found surrounded by considerable old hemorrhage which extended from the tenth thoracic vertebra to the fourth lumbar inclusive. The spinous processes of the eleventh and twelfth thoracic and first lumbar vertebræ were wanting, having been removed by surgical operation. In the peridural region at the operation level much fibrous tissue was found, the dura being much thickened and adherent to this fibrous tissue. When

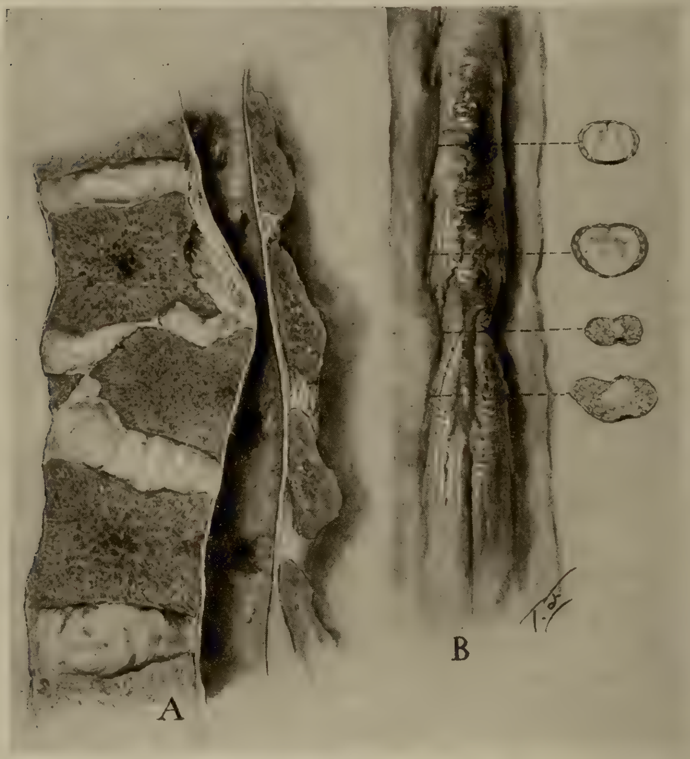

Fig. 470.—A, Sagittal section of spinal column showing injury to the bone. B, Spinal cord showing where dura laid open at site of injury. Note increased number of blood-vessels which have invaded the dura in order to take care of the injury and constriction. Also shows cross-sections made at various levels, indicating extent of damage done to the cord.

all the spinous processes were removed and the cord was exposed a sudden angulation in the cord posteriorly is seen at the level of the junction of the twelfth thoracic with the first lumbar vertebra. Here also is old subdural cord hemorrhage (Fig. 470, B). The anterior displacement of the twelfth thoracic had made definite pressure on the spinal cord. Soft, grayish broken-down material escaped through the dura of the cord at the level of the first lumbar vertebra. On section the centers of the bodies of the vertebræ contained vacant spaces, as though there had been bone absorption, except the first lumbar, which seemed to the naked eye much denser and more compressed.

Within a few days of the death of this patient a second death following compression fracture of the spine occurred in a neighboring bed on the service of Dr. Parker. His patient was injured in an automobile accident just a few days after the man I have described. He was eighteen years old and for eight weeks after his injury was treated elsewhere, being admitted to the Presbyterian Hospital October 8, 1922, with death December 18, 1922. Both autopsies were performed by Dr. Oberhelman, who must be thanked for painstaking notes and careful examination.

This second patient on admission presented a gibbus in the region of the first lumbar vertebra, was paralyzed in both legs, could not urinate, had burning sensations in his bladder, and a pressure-sore on his back. Nine days after his accident some sensation had begun to return to his legs, and after two weeks he could move the right thigh slightly. Sensation ultimately returned except over the toes of both feet. For the first few weeks after his accident he had been unable to urinate and had been catheterized at irregular intervals, but later he had regained control of both anus and bladder, passing his urine, however, only by great straining effort. There was much burning after urination and a residual urine of 10 to 12 ounces was found. He had also suffered from chills before admission.

He was examinned cystoscopically and a high-grade cystitis was found, cultures of the urine showing staphyloccoci. At a second cystoscopy the pelves of the kidney were irrigated with boric acid solution. Later an epididymitis developed, followed by prostatic abscess, with signs of kidney infection.

Autopsy: The anatomic diagnosis was compression fracture of the first and second lumbar vertebræ. Extra- and subdural hemorrhage of the lumbar cord, hemorrhagic softening of the cauda of the cord, marked atrophy of the muscles of the lower extremity, marked plantar flexion of the feet, ascending cysto-uretero-pyelonephritis, markedly dilated ureters, localized intramural abscess of the urinary bladder wall, huge decubital ulceration of the sacrum, suppurative osteomyelitis of the sacrum, thrombosis of the left common iliac vein, purulent right otitis media, moderate edema of the leptomeninges, early hypostatic bronchopneumonia, hyperplasia of the pelvic peri-aortic and mesenteric lymph-glands, general emaciation and anemia, cloudy swelling of the liver and myocardium, fatty changes of the heart, liver and kidneys, lessened yellow material of the adrenal cortices, petechial hemorrhages beneath the lining of the stomach and duodenum, fibrous adhesions between the spleen and diaphragm, bilateral fibrous pleuritis, pigmentation of the skin of the abdomen and extremities, scaly skin of the abdomen, accessory spleen.

From the external urethral orifice there was expressed yellow purulent fluid. The lower extremities were greatly emaciated, the muscles soft and small. Over the sacrum there was a round ulcerated area 9 cm. in diameter, the base of which was dark red tissue and in its center the rough and eroded sacrum was seen, together with the coccyx. There are also pressure-sores over the ischial tuberosity and at the level of the twelfth thoracic and first three lumbar vertebræ. At this point there is a slight kyphosis, but no abnormal point of motion of the bones can be found.

In the peritoneal cavity was a small amount of pale yellow slightly turbid fluid. Many loops of the small bowel were matted together by fibrous and fibrinous adhesions, mainly in the pelvis, and right lower quadrant of the abdomen, Deeper down in the pelvis the fluid was purulent and was confined in a well-defined pocket walled by loops of bowel, bladder, and rectum. The transverse colon formed a U-shaped figure in the midline. The abscess pocket burrowed down along the left wall of the pelvis to its base, with the sigmoid forming the left wall. The large bowel was entirely filled with firm fecal masses. The viscera forming the walls of this abscess were covered with a layer of thick fibrin. On the fundus of the urinary bladder there was a soft yellowish-red area 3 cm. in diameter. When a small amount of pressure was applied here blood-stained purulent fluid escaped, apparently from the urinary bladder. A perforation about 2 mm. in diameter is found leading into this area, and when the bladder is cut open this small opening leads into an abscess 2 cm. in diameter in the wall of the bladder. There was no gross evidence of communication between the inside of the bladder and this abscess in the wall of the bladder.

Both ureters were markedly dilated, the right 1.8 cm. in diameter, the left 1.2 cm. When an incision was made to remove the structures in the pelvis in the usual manner a small pocket of pus was cut into. This was contained in a cavity bound in front by the posterior margin of the symphysis pubis, below by the skin of the peritoneum, above by the prostate, and behind by the wall of the rectum. There was practically no prostate remaining except a small mass in the posterior part, the rest being destroyed by suppuration. The wall of the urinary bladder had a maximum thickness of 1.2 cm. Its lining was grayish green with black areas in many places and the blood-vessels beneath the lining were tortuous and distended. The bladder mucosa was 2 mm. thick and was fairly well intact, covered, however, by a thin layer of fibrin.

There was more than ordinary amount of motion of the spine at the level of the first and second lumbar vertebræ. Most of this, however, was located at the intervertebral disk between the first and second lumbar. All the intervertebral disks were soft and spongy.

Numerous fibrous adhesions existed between the right kidney and the perirenal tissues. The right kidney was somewhat enlarged, semifluctuant and yellowish brown in color. The capsule was adherent to the parenchyma and when stripped away left a yellowish-brown cortex, pitted in places. When the kidney was sectioned, purulent fluid was found in the pelvis, distending it so that all the calices were dilated and encroached upon the papillæ of the pyramids. In a few places grayish-yellow streaks radiated from the calices and extended to the capsule, appearing beneath the capsule as spots 1 to 2 mm. in diameter. The kidney parenchyma was yellowish brown in color, the cortical structures were indistinct, and the medulla was narrowed because of the dilated calices. The lining of the renal pelvis was greenish brown, studded with petechial hemorrhages, and thickened to at least 2 mm. The right ureter was greatly distended with material similar to that found in the pelvis of the kidney. The tissues about the right ureter were densely adherent to the right side. A probe passed through the right internal ureteral orifice passed through without resistance, but the lining about the orifice was thickened and greenish brown in color. Around the entrance of the right ureter into the bladder there were many fibrous adhesions. The left kidney was much the same as the right, except that the process here was a little more advanced. The left ureter was slightly smaller than the right and contained a well-formed spur 3 cm. distal to the junction of the ureter with the renal pelvis.

The lining of the superior and inferior vena cava was smooth and glistening, but in the left common iliac vein there was a thrombus which totally occluded the lumen. This thrombus was 4 cm. long, adherent to the lining, and its distal end was found at the bifurcation into the external and internal iliac vein. Blood-vessels and heart otherwise negative.

There was a distinct bending of the lumbar spine at its upper end to the right. This was because the vertical thickness of the body of the first and second lumbar was partially diminished. A compression fracture of these two vertebræ existed. Along the left side of the body of the first lumbar vertebra there is proliferation of bone at the plane of fracture. The muscles about the spine are soft, flabby, and atrophied. This is also true of the iliopsoas muscle.

The portion of the spine removed included the twelfth thoracic down to the fourth lumbar vertebra. The distance between the lower margin of the twelfth thoracic vertebra to the upper margin of the second lumbar vertebra on the right side was 4.1 cm. Measured from a similar location on the left side it was 2.8 cm. These measurements included the intervertebral disk both above and below the first lumbar vertebra. The height of the first lumbar vertebra itself on the right side was 2.8 cm., on the left side 1.6 cm. There was considerable roughening of the left side of the bony surface of this first lumbar vertebra. Because of the difference in the vertical height of the two sides of the first lumbar vertebra there was a bend to the right of this part of the spine, so that the upper part of the spine made an angle of about 10 degrees with the vertical plane of the lower portion. All the intervertebral disks were very soft and spongy; the maximum width of the first lumbar intervertebral disk was 1.3 cm. on the right side and 0.9 on the left. That of the disk between the twelfth thoracic and first lumbar vertebræ on the right side was 0.5; on the left 0.4; and of the middle in front was 0.7 cm. There was blood about the dura of the cauda equina and about the cord at the level of the twelfth thoracic and first lumbar vertebræ. Here the fat was red to brown in color because of old blood in it. Fibrous adhesions were present between the dura on the front of the cord and the bony canal at the level of the first lumbar vertebra, so that when the cord was removed a part of the dura remained adherent to the lining of the spinal canal. A marked prominence in the spinal canal was present, the upper margin of which lay at the level of the junction of the twelfth thoracic and first lumbar vertebræ. This prominence was 4 cm. in height and 1 cm. from front to back, while its width was equal to that of the transverse diameter of the spinal canal. Its upper surface was almost at right angles to the vertical diameter of the twelfth thoracic vertebra and it represented a marked backward displacement of the first lumbar vertebra in its relation to the twelfth thoracic. At this level the cord was yellowish brown, soft, and very friable. At the level of the second and third lumbar vertebræ the cauda was also stained brown. The maximum front to back diameter of the spinal canal was just above the lower margin of the twelfth thoracic vertebra, equaling 1.5 cm. The smallest diameter, which is 0.5 cm., was just below this, so that there was caused a marked flattening of the spinal cord at this level.

Treatment.—No matter how evident the patient's symptoms of complete cord severance may be, we should always give him the benefit of doubt in advising operation for decompression of the cord. When shock is not a factor to be considered, and the patient's general condition is such that he will stand operation, laminectomy at once may relieve pressure on the cord caused by hemorrhage and edema.

When the cord has been cut in two no operation will be of avail; however, all the symptoms of complete severance may be merely simulated. Laminectomy might be possible where complete roentgenologic examination is not available. Allen's procedure may be adopted without increasing the amount of permanent damage to neurons, and the cord, after opening the dura, may be incised in its longitudinal axis to afford drainage of blood and edema.

Laminectomy must be carried to a point well beyond the pathology present in both bony and nervous spines; then it promises a maximum amount of return of function in those cells and neurons not completely destroyed. When the cauda has been torn, it may be successfully sutured.

If no operation is performed in the presence of paralytic findings, the future care of the patient is the same as if laminectomy had been undertaken. Nursing care must be constant to obtain frequent change of position, and to avoid constant pressure over points of the body such as the heels and buttocks. Along with that goes the necessity for cleanliness to guard against skin contamination by urine and feces which may be evacuated without the patient's knowledge. A water- or air-bed is almost an absolute necessity in nursing care. When the bowels become distended from retained gas and feces colonic flushing is indicated; even the digital removal of inspissated masses from the rectum may be required.

The bladder and urinary tracts require incessant care. One of two policies is usually adopted: first, the bladder is allowed to distend until it reaches that point where, aided by suprapubic pressure, an overflow begins through the forcibly opened sphincter. This may be aided by gently stroking the inner side of the thighs. The urine is obtained by catching it in the urinal which is constantly in place. When there is priapism, this problem becomes quite difficult. For pain from the distended bladder or priapism small doses of morphin may be given, but they have an untoward effect on the bowel. This incontinence of retention is carried on indefinitely until the patient regains some control over the act of urination, and no infection of the urinary tract should result.

The second policy is the one commonly adopted, namely, catheterization of the patient early, perhaps only a few hours after the accident. My main idea today is to induce practitioners to abandon catheterization, because when repeated at irregular intervals the patient soon develops cystitis and its sequelæ. If catheterization has been performed and infection has been started, I believe that constant drainage of the urinary tract becomes imperative. This cannot be accomplished by ordinary catheterization, but must be secured by means of an indwelling catheter removed only when necessary to cleanse away phosphatic or mucous accumulations. The bladder should be washed out once in every twenty-four hours with sterile boric solution, and a few ounces of 10 per cent. argyrol solution should be left in the bladder. The constant drainage by the catheter removes all pressure within the urinary tract, and with the help of urinary antiseptics administered by mouth promises to keep any infection below a danger level. A patient with a well-developed cystitis and urinary tract infection requires suprapubic cystotomy with proper tight drainage and bladder irrigation. I believe also that cystoscopy is absolutely contraindicated for these patients; it adds to the severity of the infection and may set up other foci of infection. Cystotomy may help, but surely catheterization of the ureters and pelvic lavage of the kidneys will lead to no benefit in these patients when the bladder outlet is paralyzed. There is no necessity

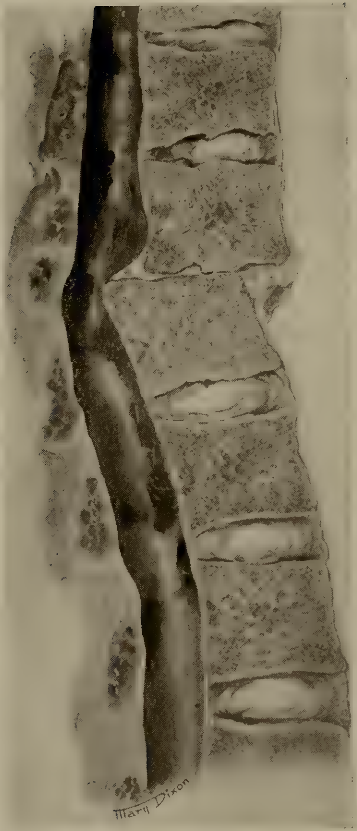

Fig. 471.—Drawing of spinal column removed at autopsy. This consisted of an area from the tenth thoracic to the fourth lumbar vertebra inclusive. There was a distinct slipping forward of the twelfth thoracic vertebra. The middle of the body of the first lumbar vertebra presented a deep encircling furrow running at a right-angled plane to the long axis of the spine. At the lower part of the furrow-like construction there was rough irregular bone and on the right side close to the transverse process there was a hard projection of new bone formation which extended half-way up on to the twelfth thoracic vertebra and for at least 2 cm. to the right. That portion of the spine above the lumbar vertebræ formed an angle of about 5 degrees with the lower portion because of a sudden angular bend to the right at the junction of the thoracic and lumbar portions.

for investigating the inside of the bladder in this type of infection.

After the patient has settled into his routine and pending the arrival of power in his leg muscles, daily massage with movements of all joints in the paralyzed area is indicated. Every effort should be made to keep the peripheral circulation in a normal condition, and yet blood-vessel walls must not be traumatized to favor the formation of mural thrombi. When the urinary tract is even slightly septic, the blood-stream may contain bacteria which eagerly seize any opportunity to form thrombi in the veins. The patient should be turned from side to side in the bed, encouraged to raise his body and arms, and exercise his trunk so that as soon as he is able he can be stood up and encouraged to attempt leg movements. We use a monkey pole over the bed within easy reach. The upright position may hasten return of bladder control. A plaster-of-Paris molded corset is applied before the patient is permitted to get up at all.

Should thrombosis appear and leg swelling become evident, we must avoid embolism by again confining the patient to bed. The prognosis becomes very bad. In a few recorded instances, however, men have lived for years with severe infections in the urinary tract and complete loss of leg power.

Compression fracture without nerve symptoms—at least gross symptoms—is being recognized. Pain, constant, dull, or rather severe, is the outstanding symptom. Usually in such an instance the pathology is simple, that is, the corpus of the vertebra is compressed, but there are no complicating changes. After a few months the patient whose spine has gone unsupported in body weight bearing has a steady increase in back pain and ultimately develops nerve symptoms. These may first attack the bladder, leading to difficulty in urination or sudden urinary incontinence. Leg paralysis may follow rapidly, sometimes preceded by paresis in certain muscle groups.

Such a compression fracture requires spinal support from the very start. This is generally provided for by a plaster-of-Paris corset, made to be removed at night when the patient goes to bed, and takes weight bearing off his spine. Robust men or others who do not wish to put up with the uncertainty of a cure and spinal immobilization by the plaster corset can be offered spinal fixation by bone-graft. For working-men I sometimes perform this operation as soon as a diagnosis is made before cord pressure symptoms supervene.

CLINIC OF DRS. EDWARD LOUIS AND LOUIS D. MOORHEAD

Mercy Hospital

DOUBLE INTUSSUSCEPTION OF THE UPPER JEJUNUM

Patient Brought to Hospital with Diagnosis of Obstruction at the Pyloric End of Stomach and at the Beginning of the Jejunum. Operation Revealed a Double Intussusception of the Upper Jejunum. Discussion of Intussusception.

This patient is brought before the class today on account of the interesting history he gave, the preoperative diagnosis which was made, and the pathologic findings at operation. It is an illustration of the old saying "that the diagnosis of intra-abdominal conditions is often made after the abdomen is opened." The patient was brought to my clinic for operation October 29, 1922. His attending physician stated that there was an obstruction at the pyloric end of the stomach and also at the beginning of the jejunum. This statement was based upon the history, the physical examination, and the *x*-ray examination. The history is as follows: Male, aged fifty-four years. Laborer. For the last six years he has had gastric distress. Vomited nearly every morning after eating breakfast. There was no special pain associated with the vomiting.

Two weeks before the patient entered the hospital he was seized with a sudden severe attack of generalized abdominal pain. Pain was so severe that it doubled him up and he was compelled to lie down. He did not vomit at this time. He was given some medicine by a druggist, but obtained no relief from the pain until late that evening, and after applying heat to the abdomen by the use of hot-water bottles.

During the night the bowels moved and by the next morning he felt fairly comfortable. There was no history of having passed blood with feces at any time. For the two weeks intervening between the attack and the time he entered the hospital he remained in bed at home. He felt very weak and was unable to take any nourishment except liquids. There was considerable distress in the upper abdomen. During the past three months he had lost 30 pounds in weight. There is no history of previous illness except the gastric distress, constipation, and vomiting, as previously stated. There is nothing in the family history that might have a bearing on the case.

Physical Examination.—Head and neck negative. Chest and lungs: Apices fill well, breath sounds normal. Heart: No increased cardiac dulness, no murmurs. Abdomen: Distended, but not very rigid. No palpable tumor mass, but an area of tenderness in epigastric and left hypochondriac regions. Spleen not palpable. Liver not enlarged. Genito-urinary system negative.

Radiologist's Report.—Chest: The fluoroscopic examination showed the hilus markings definite. There was a slight lateral enlargement of the arch of the aorta. The right diaphragm did not move freely upon deep inspiration and showed a slight irregularity. Stomach: The fluoroscopic examination by means of the barium meal showed no lagging in the esophagus. The stomach reached 2 inches below the crest of the ileum. The peristalsis was active. The pyloric antrum and duodenum appeared to be considerably displaced to the left. The emulsion passed from the stomach into the first portion of the duodenum in canalization form. When the emulsion reached the junction of the third portion of the duodenum and the jejunum there appeared to be a considerable fixation, causing rather marked dilatation in the third portion of the duodenum. From this point several reverse peristalses were observed during the fluoroscopic examination.

The radiograms taken immediately after are confirmatory of the fluoroscopic findings. They further show practically an absence of the entire pyloric antrum. The five-hour radiogram shows nearly 30 per cent. of the emulsion in the stomach.

Conclusions.—Possibly pancreatic malignancy involving the pyloris and duodenal region, with possibilities of adhesions causing partial constriction at the junction of the third portion of the duodenum and jejunum.

Upon presentation of the foregoing history and *x*-ray report it was suggested that the patient would be benefited by an operation, if the obstruction could be relieved, by freeing adhesions and perhaps performing gastrojejunostomy or such other surgical procedure as the conditions might require.

Operation.—Ether anesthesia. Incision to right of midline from ensiform to level of umbilicus. Right rectus displaced outward. Peritoneum opened. The anterior surface of stomach was found to be rather firmly adherent to the parietal peritoneum of the abdominal wall. This was separated very gently until the stomach could be *delivered.* At the pyloric end of the stomach and the first portion of the duodenum the adhesions were found to be quite dense, due, no doubt, to a peritonitis, at some time, from a pre-existing duodenal ulcer. The freeing of these adhesions was carried only so far as to allow the stomach to be delivered in the abdominal wound, and to feel assured that the pyloric obstruction was relieved. Attention was next directed to the dilated third portion of the duodenum and beginning of the jejunum. Here was found a soft cylindric tumor mass about 2½ inches in diameter and 10 inches in length. It proved to be an intussusception of the jejunum, extending downward from about 1½ inches from the beginning of the jejunum. The lower portion of the tumor mass was curved toward the midline and slightly upward, the concavity being directed toward the mesenteric portion of the intestine. The intussusception was released without much difficulty, but it was discovered that instead of a single intussusception, it was double, that is, the original intussusception had invaginated into the bowel immediately below it. As the last portion of the invagination was released there was found in the wall of the jejunum a hard tumor about the size of a hen's egg. This was the starting-point or apex of the intussusception. The tumor was enucleated by incising the serosa of the bowel and separating the muscularis and the resulting wound of intestine closed by two rows of sutures. The mucosa was not incised and consequently the lumen of the bowel was not opened. After applying warm moist pads for a short time to the bowel involved in the intussusception the circulation in the bowel improved. The bowel was returned to the abdomen, the peritoneal toilet completed, and the abdomen closed in the usual manner. In the after-treatment nothing was given by mouth for seventy-two hours. Fluids were given per rectum. After the first seventy-two hours fluids were given by mouth and gradually the diet was increased, until by the eighth day he was on a fairly liberal diet. There was no postoperative vomiting, no special pain, bowels moved on fourth day without any assistance. Patient was up and around at the end of two weeks. Convalescence was uneventful.

Pathologist's report states that tumor of intestinal wall is a fibroma.

It is now ten weeks since the operation. Patient states that he has gained 15 pounds in weight and has not taken a cathartic since the operation, the bowels moving regularly without their use. His appetite is good and there is no further gastric distress. In this connection it is interesting to compare the x-ray plates and fluoroscopic examinations made before and after operation. While in the preoperative plate and fluoroscopic examination the report stated that the pyloric antrum and duodenum appeared to be considerably displaced to the left, and that the emulsion passed from the stomach into the first portion of the duodenum in canalization form, and that the third portion of the duodenum was dilated, and in the five-hour picture 30 per cent. of the emulsion was found to remain in the stomach, the postoperative reports state that the pyloric obstruction has been relieved, there is no deformity of the duodenal cap, and the emulsion passes through the third portion of the duodenum without any obstruction. The five-hour picture shows the stomach empty and no evidence of the intussusception.

A review of medical literature on the rôle of tumors of the small bowel in the production of intussusception reveals some interesting facts. The paucity of cases reported since 1915 is striking. The greater number are to be found previous to that date. Heurtaux, in his investigations, collected 50 cases, and these were distributed as follows: Fibroma, 3, adenoma, 4; myoma, 32; lipoma, 8; angioma, 3. King, covering the literature for the same period, found 65 cases, but his proportional distribution is similar to the above. Elliot and Corscaden, working together, and Kasemeyer and Steten, working independently, report a somewhat larger total of cases, but do not give the pathologic distribution.

A consideration of the above records, as well as a review of the cases reported since that time, emphasize the rareness in which a fibroma is the offending tumor in the production of intussusception, as well as the fact that in most cases does the tumor occur at a lower place in the intestinal wall. The existence of an intramural affair is uncommon, as in nearly all instances the tumor is within the lumen of the bowel.

One of the common forms of intestinal obstruction is intussusception, that is, the prolapse of one part of the intestine into the interior of another immediately adjoining. If a section is made through an intussusception, three layers of intestine are divided, the innermost, or entering layer; the outermost, or sheath; and the middle, or returning one, in which the mucous surface is outside, facing the mucous surface of the sheath, and the peritoneal inside, facing that of the entering layer. The two inner layers are known as the intussusceptum. In the present case, on account of the intussusception being double, five layers of intestine would have been found upon section.

The mesentery, of course, is carried in with the bowel, lying between the peritoneal surfaces of the inner layers, and dragging the intussusception into a cone, the apex of which lies at the point, the base at the neck. A certain amount of elongation is necessary to allow this, but, owing to the direction taken by the bowel, not so much as might be expected; and as an ileocecal intussusception can reach the rectum within a few hours, the increased length is not due merely to stretching. The effect of this traction is, in general, to throw the intestine into a curve, and to tilt up the orifice of the intussusceptum, so that it has the aspect of a slit and looks toward the side of the bowel rather than down the axis. Intussusception exists in two different forms. In the common one, the apex of the invagination never changes; the part that entered first continues in front throughout and the increase is entirely at the expense of the sheathing layer; in the other (ileocolic), which only occurs at one part of the intestine and is rare there, the ileum slips farther and farther down the colon through the valve, without the cecum following it; the increase is entirely at the expense of the small intestine, and the apex is constantly shifting. Not infrequently after a time this variety changes into the other.

The four usual varieties of intussusception are: first, the ileocecal. This is the most common form and constitutes 44 per cent. of all cases. In it the ileocecal valve forms the apex, and owing to the great mobility of the ileum a considerable portion of the bowel may be invaginated, passing through the colon and rectum and appearing even at the anus. Second, the enteric variety, involving the small intestine, usually the lower jejunum, and rarely of great size, accounts for about 30 per cent. Third, the colic form may occur at any part of the colon or rectum, and, owing to the fixity of this portion of the gut, is limited in extent, and occurs in about 18 per cent. of the cases. Fourth the ileocolic, in which the ileum is prolapsed through the ileocecal valve, which for a time retains its normal position, but after the intussusception has attained a certain size the valve and cecum are also invaginated into the ascending colon. This variety constitutes about 8 per cent. of all the cases.

The frequency with which ileocecal intussusception occurs is due to some extent to the difference in size between the two parts and to the fixed position of the cecum. There is a very close analogy between the sphincter-like ileocecal valve and the sphincter of the rectum, and between the invagination that takes place at the one and the prolapse that occurs with equal frequency, especially in children, at the other.

Ileocecal tenesmus probably sets in whenever there is any violent catarrh or abdominal irritability of the intestine, just as anal tenesmus occurs in similar conditions of the rectum; and the repeated and forcible peristalsis, driving down on to the firmly closed ileocecal valve, causes intussusception in the one case, just as it causes prolapse of the rectum in the other. If the cecum is freely movable, as it usually is in children, ileocecal intussusception occurs; if, on the other hand, it is fixed, as in adults, ileocolic. When once the invagination has commenced, the contact of the swollen and congested apex, stimulating the walls of the intestine below, tends to make it increase indefinitely. In many of the cases of intussusception no exciting cause can be found. It is undoubtedly more common in delicate patients than in those who are strong and robust. In most instances where there is a definite reason for its occurrence, it has followed diarrhea, free purgation, or colic due to the presence of undigested food. Possibly slight degrees of it, undergoing spontaneous reduction, occur more commonly than is usually imagined in severe colic attended with great prostration. In some instances it has followed injury, blows upon the abdomen, or jumping a child up and down, and there is no doubt that the presence of polypi or fibrous tumors of the intestine predispose to it.

The method of production is much the same whether the intussusception is due to paralysis or to spasmodic contraction (which is the more usual of the two) affecting one segment of the bowel. The intestines above scarcely take any share in the proceeding; the longitudinal fibers simply keep drawing the bowel from below, over the narrowed part, until an invagination is produced, and the apex has become swollen and congested. The effect on the intestine of an intussusception chiefly concerns the invaginated part and its mesentery. The sheath may escape altogether, although sometimes it becomes gangrenous, and the part above at first shows scarcely any change; later it may be dilated and the walls hypertrophied, or ulceration may occur and end in perforation. It all depends upon the character of the constriction; where this is very tight the bowel inside becomes intensely congested, blood pours out from the mucous membranes, the walls become thickened and almost solid, especially along the convexity and at the apex, and the intussuscepted part soon becomes gangrenous. The middle layer usually suffers the most severely; in some instances the whole invagination is destroyed and comes away in a mass, the separation taking place at the neck; more frequently it is detached in shreds, and occasionally the inner coat is gradually cut off from the rest, unfolded, and passed with the middle layer, turned inside out. Where the constriction is less severe a low form of inflammation sets in, the walls become thickened, adhesions form between the peritoneal surfaces, sometimes at the neck only, but more frequently wherever they are in contact, and if the patient lives the whole of the intussuscepted part may at length slough off. Very often the intussusception is irreducible, even where there are no adhesions—the walls are so thickened, especially along the convexity, and the apex is swollen out to such an extent, that the tissues cannot be unfolded without being torn. The same result may follow from twisting of the bowel inside the sheath, from rigid contraction of the ileocecal valve, or from the presence of a polypus springing from the mucous membrane, or a fibrous tumor of the intestinal wall.

Where the constriction is very lax there may be scarcely any alteration even after months, but not unfrequently after some little time the symptoms suddenly change and become acute. Peritoneal adhesions are more common in chronic than in acute cases, and often render reduction impossible. Sometimes they are only at the neck, or they may be general, or limited to the first part invaginated, so that the whole can be reduced with the exception of the last few inches. The walls of the bowel above are hypertrophied; sometimes there is considerable distention, owing to the narrowing of the passage by the swelling and bending of the intussuscepted part. Ulceration may occur, but when the bowel becomes gangrenous the process is usually more gradual than in the acute cases; it may involve the mucous membrane only or it may begin at the apex of the invagination and extend slowly upward.

Acute intussusception occurs most frequently in children, more than half of the cases being under ten years of age, the large proportion during infancy. The onset is sudden, attended with severe pain, more or less paroxysmal at first, but rapidly becoming continuous and diffused over the abdomen. Vomiting usually follows, but is not so constant or severe as in acute strangulation. Absolute constipation is hardly ever present, but diarrhea and the discharge of blood and mucus from the anus, with well-marked tenesmus, are common. Collapse soon supervenes and may be so severe as to result in death within twenty-four hours, or death may follow as a result of exhaustion or peritonitis in a few days or a week. Unless peritonitis is present there will not be much distention or tenderness of the abdomen. In many cases a distinct tumor can be palpated. It is usually described as sausage shaped, following the course of the intussusception and generally curved, owing to the traction on the mesentery. In the ileocecal variety it extends from the right iliac fossa across the brim of the pelvis to the left, the colon being dragged downward. In other cases the tumor may be more limited and distinctly movable. A rectal examination should always be made, as frequently the tumor may be palpated in this way.

Treatment.—Acute intussusception differs from the other forms of intestinal obstruction in the fact that a certain proportion of cases recover spontaneously, the bowel either releasing itself or becoming gangrenous and sloughing off. How often the former of these occurs it is impossible to say; probably it takes place in many of the cases of severe intestinal colic, in which opium gives such complete relief, but there is no means of proving it. The latter is too exceptional an occurrence, especially in the young, to deserve any reliance; and it is probable that it is much more rare than statistics show. Besides, even when it does happen, over 50 per cent. of the patients die from effects directly connected with the process; the separation is premature; or the ulceration continues and leads to perforation; or hemorrhage occurs; or the patient dies from prolonged exhaustion. Enemata are often successful in the early stages, especially when the large intestine only is concerned. When the tumor is to be felt on the right side, or even in the midline, the chances are much less; and if inflammation has set in and caused the formation of adhesions, or if the intussuscepted part has become thickened from long-standing congestion, success is out of the question, the bowel will give way sooner than unfold.

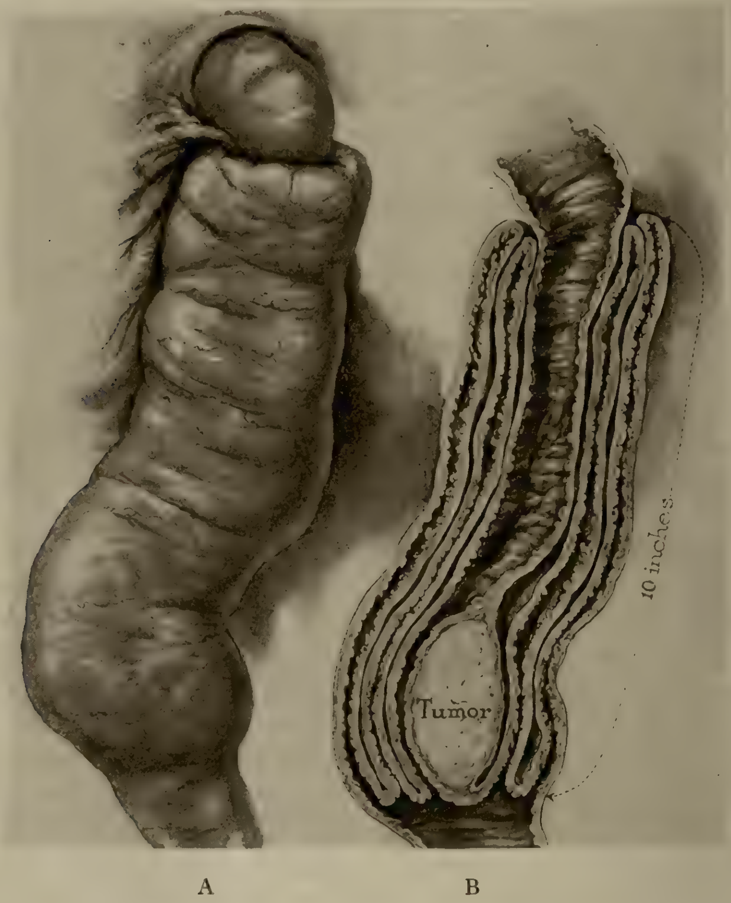

Fig. 472.—A, Appearance of intussusception at delivery before attempt at reduction. Note the close proximity of the mouth of the intussusception to the beginning of the jejunum and the infolding of the mesentery. B, Cross-section showing the double intussusception and the location of the fibroid tumor in the intestinal wall.

Insufflation with air has been recommended on the ground that the bowel is not so likely to be ruptured; on the other hand, water has succeeded after air has been tried and failed. Moreover, the quantity of water used can be measured more easily. Should these measures not succeed, operation is indicated. In reducing an acute intussusception the mass should, if possible, be brought outside the abdomen. Traction should not be made upon the intussusception, but reduction should be effected by squeezing the intestine below the intussusceptum and so forcing it out. Should reduction be impossible by this means, resection or other operative procedure on the intestine itself is indicated. In case any gangrene exists at the neck, no attempt should be made at reduction. Pressure should be firm, gentle, and continuous. Any injury to the peritoneal coat of the intestine should be carefully sutured after reduction. If the intussusception is irreducible but not gangrenous, resection of the entire mass is advisable if the patient's condition is good. If gangrene exists, excision of the mass with lateral anastomosis or excision with the formation of an artificial anus is indicated. In some cases the patient's condition is so bad that no more can be done than to bring the affected intestine outside the abdomen while rapidly forming an artificial anus above the site of obstruction. In other cases there may be time to perform a lateral anastomosis in addition to this procedure.

Chronic intussusception is more favorable in its prognosis. It is frequently unrecognized until an exploration of the abdomen is made. In some cases the intussusception may be reduced by simple manipulation, but, as a rule, too many adhesions are present, and it will be necessary to make a resection of the affected bowel and a lateral anastomosis.

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CLINIC OF DR. VERNON C. DAVID

PRESBYTERIAN HOSPITAL

CONGENITAL STRICTURE OF THE RECTUM IN CHILDREN

Four Cases Illustrating Different Phases of Congenital Malformations at the Anal Opening of the Bowel. Discussion of Anal Malformations. Treatment Employed in Present Cases.

WE are asked to examine an infant patient who comes to the hospital with the complaint of heart trouble, failure to gain, and distention of the abdomen.

Case I.—Female, F. M., aged sixteen months, enters the Presbyterian Hospital on the service of Dr. Walter F. Winholt. The patient's complaints are heart trouble, failure to gain, and distended abdomen. Since birth the abdomen has been distended, but more so during the past three months. The child has had bowel movements which are greenish yellow and not watery. Her weight at birth was 5 pounds, 5 ounces, and this weight has increased to between 9 and 10 pounds, and remains stationary at that point.

Physical examination reveals a pale, underdeveloped, poorly nourished child, with a distended abdomen. The abdomen is filled with a tumor, reaching from the symphysis to the ensiform, which is doughy and can be pitted on pressure. The abdominal wall is thin, but when attempts are made to palpate the tumor, marked rigidity of the abdominal muscles results. The heart is enlarged to the right and left and a marked systolic blow is heard at the apex, which is transmitted over the entire chest. The posterior cervical and axillary lymphatic glands are enlarged.

Rectal examinations reveal a very hard mass completely filling the rectum and bulging into the anal region which is with difficulty differentiated from a bony deformity of the pelvis, or from a bony tumor from the pelvis. It is, in reality, the lower border of a fecal impaction. This is almost entirely separated from the examining finger by a diaphragm of mucosa which is about 3 cm. distant from the anal orifice, and in the center of which is a small opening. This obstructing membrane resembles in form the iris of the eye, with the central opening corresponding to the pupil. There is no rectovaginal fistula (Fig. 473, 1).

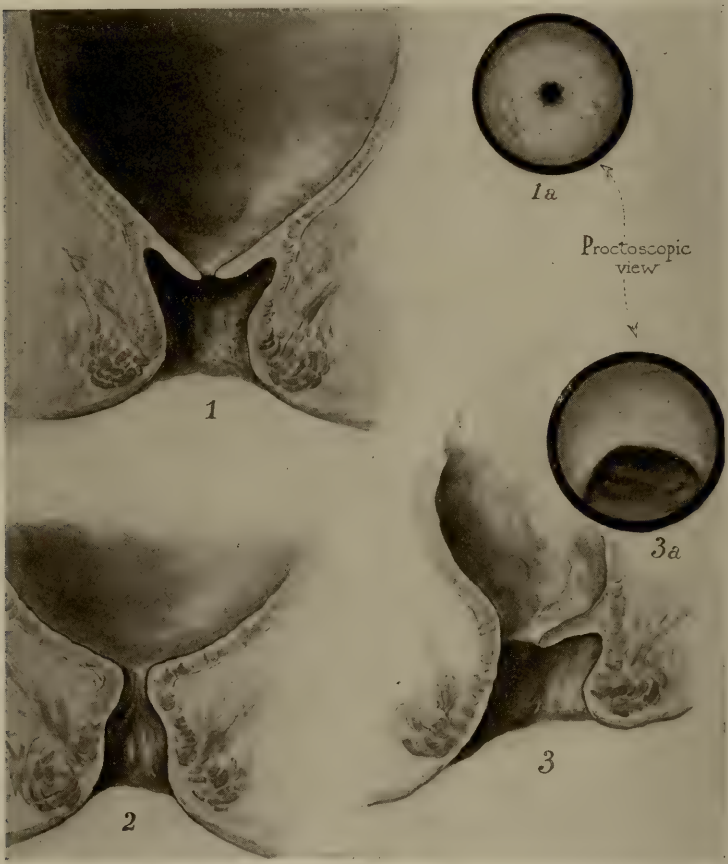

Fig. 473.—Different types of congenital rectal strictures.

x-Ray examination by barium enemas show enormous dilatation of the sigmoid, which almost completely fills the rectum.

Operation (July 26, 1922).—Dr. V. C. David. Circular anesthesia of the rectum by injection of ½ per cent. novocain. A small speculum is introduced into the rectum and the opening in the obstructing strictures is seen to be about 4 mm. in diameter. Beginning with a sharp-pointed artery forceps the opening is gently dilated. The smallest cervical dilator is now used, and dilatation is increased until the opening is about 1 cm. in diameter. At this point the diaphragm is cut through in the direction of the long axis of the bowel, and further dilatation employed until an index-finger can be introduced through the stricture into the bowel above, which is filled with dry, hard fecal masses. A considerable amount of this is removed. The mucosa is now mobilized by blunt scissor dissection so that the longitudinal stricture can be sutured transversely. This assures a permanent widening of the strictured area which allows the passage of the index-finger through it (Fig. 474). It is the thought of the operator to perform the same operation on another segment if the first operation does not gain enough room.

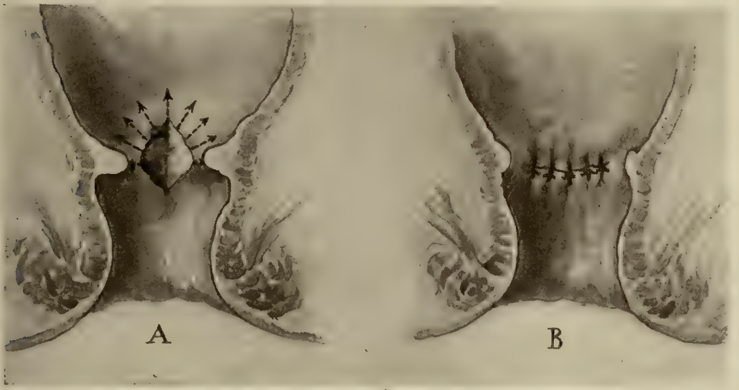

Fig. 474.—Operative treatment of congenital rectal stricture by longitudinal incision and transverse suture.

After-history.—Oil retention enemas were given each day as well as repeated retention enemas of small amounts of water.

On the fourth day the child passed a large amount of fecal matter during the day and the large mass in the abdomen disappeared. The strictured area was examined from time to time and the index-finger passed through it. A number of small fecal impactions were broken up and passed.

In August the patient developed diarrhea, took her food poorly, and on August 22d died.

Autopsy by Dr. H. A. Oberhelman.—The enormous enlargement of the sigmoid had disappeared, while the bowel was hypertrophic and somewhat larger than normal. It in no way resembled the picture obtained by *x*-ray before dilatation of the stricture, where the sigmoid almost completely filled the abdomen. All of the fecal impaction had evacuated except one mass the size of a small peach, which was in the lower sigmoid. The bowel completely enclosed the mass, so that it appeared to obstruct the bowel, though there was no dilatation of the bowel about it. The stricture had remained dilated to the point where the index-finger could be passed through it. The mesosigmoid was greatly enlarged and the cecum could be moved to the extreme left portion of the abdomen. The heart showed a defect in the membranous septum, a Meckel's diverticulum was present.

Before discussing the pathogenesis of this congenital rectal stricture a short résumé of the histories of 3 other patients will be given, which illustrate other phases of the same subject.

Case II.—Case of megacolon in a boy four years old, on the service of Dr. Dean Lewis. The patient had had involuntary bowel movements since birth. Rectal examination revealed a rectal stricture as illustrated in Fig. 473, 2, which was associated not only with a circular narrowing of the mucosa, but with some constricture of the muscularis as well. This stricture was about 3 cm. from the anal orifice. It was dilated with cervical dilators up to the size No. 21, and then small incisions were made about the circumference of the stricture and further dilatation continued until the index-finger could easily be passed by the narrowed portion of the bowel. A colostomy which had been previously made was closed; the patient passed normal voluntary bowel movements.

Case III.—A femal child, seven years of age, on the service of the author at the Children's Memorial Hospital. The patient has had incontinence of feces since birth, coming in attacks each week, and occurring several times a week. These attacks occur without nausea or fever, but are accompanied by some pain in the region of the umbilicus, and the presence of a mass in the abdomen. These attacks clear up with the passage of an enormous bowel movement. While she was in the hospital she complained of considerable abdominal pain, marked distention of the abdomen, and incontinence of feces was present.

Examination revealed a pale child with marked distention of the whole abdomen, especially around the umbilicus, and associated with general muscular rigidity. No masses were palpable. Rectal examination revealed a sickle- or valve-like-shaped diaphragm occluding the anterior two-thirds of the rectum, at about 3 cm. from the anal orifice (Fig. 473, 3). Under ether anesthesia this membrane was divided longitudinally, the constricture was well dilated, the mucosa was mobilized around the longitudinal incision, and a transverse suture of the division was made (principle of Mikulicz). The index-finger could now be passed through the strictured region with ease. After the operation the patient had normal bowel movements and no involuntaries. Before discharge from the hospital the wound had healed and the rectum was well open.

Another case will be briefly reported having a stricture of the rectum consequent to a congenital deformity in which the same principle of operative treatment was utilized.

Case IV.—Male infant, two months old, entered the author's service at the Cook County Hospital April 19, 1922. The child was born with an imperforate anus, and was operated upon twenty-seven hours after birth, when a longitudinal incision was made in the anal region and the rectal end of the bowel pulled down 2 inches and attached to the skin. The baby has gained very little, has infrequent bowel movements associated with distention of the abdomen. The anal opening is a small slit in the middle of a scar running from the perineum to the coccyx. It is about 5 m.m. in diameter.

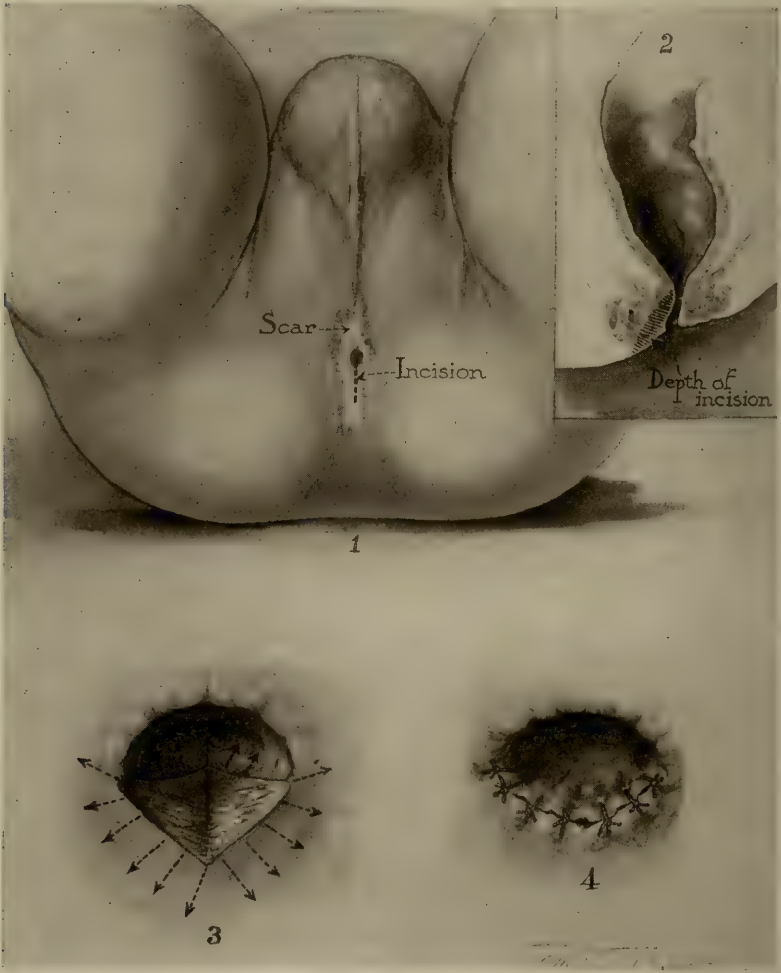

Fig. 475.—1–4, Stricture following incision for imperforate anus and operative treatment.

Under ether anesthesia very small cervical dilators were passed, but the stricture was fibrous and dilated with difficulty, so a plastic operation was advised to definitely increase the size of the anal opening. Under ether anesthesia the anal opening was dilated with small cervical dilators until it was about 1 cm. in diameter. As tearing of the margins began, a longitudinal incision was made through the stricture on the posterior wall of the bowel down to and including some of the fibers of the sphincters. This incision was also extended posteriorly about $\frac{3}{4}$ inch on to the skin. Dilatation was now carried out until it was possible to introduce the little finger through the constricted area. The mucosa above and skin below was so undermined and mobilized by blunt dissection until the longitudinal incision could be sutured transversely, bringing the mucosa down to the skin (Fig. 475). The child is now gaining and having regular bowel movements, and a No. 11 cervical dilator is being passed every week to keep the stricture from reforming.

These 4 cases illustrate somewhat different phases of congenital malformations at the anal opening of the bowel. The different types of imperforate anus, varying from complete lack of formation of the rectum to the incomplete formation of the rectum with fistulæ leading from the rectal pouch to the bladder, urethra, vagina, and perineum, are well known and well described in many text-books of embryology, pathology, or surgery. In contrast, congenital strictures of the rectum with the external anal opening of the bowel apparently normal are rare, and not only is scant mention made of them in text-books, but reported cases are very infrequently seen. Membranous or solid occlusions of the duodenum and esophagus are well known in the literature and are due to a persistence of the solid tube structure in them when the embryo is about 12.5 mm. long (Tandler). The colon and rectum has no solid tube structure in its developmental stage, and we must look to other anomalies of development for the explanation of the formation of congenital rectal strictures.

In the embryo the urinary tract and lower intestinal tract are at first one cavity, formed by the closure of a groove of epiblast lying in front of the spine. This cavity or cloaca is divided into an anterior and posterior portion by the urogenital membrane, so that the anterior portion becomes urinary bladder and the posterior portion the rectum or mesenteron. The mesenteron descends toward the perineum, where an infolding of epiblast, called the proctodeum, at the back of the embryo, turns in to meet the descending mesenteron. The proctodeum forms the anus. Failure of the urogenital membrane to completely separate the rectum from the bladder or failure of the proctodeum to meet and unite with the mesenteron are responsible for the malformations occurring in this region. Bodenhamer in 1860 classified these malformations as follows:

1. Preternatual narrowing of anorectal region without complete occlusion.

2. Complete occlusion of anus by a simple membranous diaphragm or by an integument.

3. Anus absent. Rectum ends in a culdesac at a greater or less distance above its normal outlet, without any connection whatever internally or externally.

4. Anus normal externally, but ends on a culdesac, and the rectum ends in a blind pouch at a greater or less distance above, the sac being separated by a septum.

5. Anus absent. Rectum is prolonged in the form of a fistula to terminate by an abnormal anus at the glans penis, labia pedenta, or at any point about the perineum or scrotum.

6. Anus absent. Rectum terminates in the bladder, urethra or vagina, or into a cloaca in the perineum with the urethra and vagina.

7. Anus and rectum normal, but the ureters, the vagina, and uterus open into the rectal cavity.

8. Rectum entirely absent.

9. Rectum and colon absent. Bowel may open by an abnormal sinus in some unusual part of the body.

The rectal strictures described in the first 3 cases fall into the first of these classifications, viz., preternatural narrowing of the anal region without complete occlusion. Practically all of these strictures occur about 3 cm. from the anal opening and are of various shapes. The congenital narrowing of the rectum may be valvular or tubular in form. The valvular stricture may occupy the location of a Houston valve and be due to a simple hypertrophy of the Houston valve. More commonly they are membranous or diaphragmatic strictures and are due to an incomplete union between the anus and the rectum. They occur slightly above the mucocutaneous level and are about 3 cm. above the anal orifice. In shape they resemble the iris of an optical instrument with a small central opening, or may be like a hymen with rough ragged edges surrounding the central opening. The diaphragm may be semilunar or sickle shape, as was seen in one of our cases. The valvular or diaphragmatic strictures just above the mucocutaneous level are usually only about 3 to 5 cm. thick and consist of mucosa and submucosa. They are soft and pliable and the mucosa of the rectum below the diaphragm is normal and not leather-like and indurated, as it is in inflammatory strictures of the rectum.

Congenital strictures of the rectum which are cylindric or tubular have been reported where a tube of tissue with a small lumen connected the anus to the rectal pouch. These are due to failure of development of the proctodeum or of the descending pouch of rectum. They are usually 2 to 3 cm. in length and have rigid walls, which include all layers of the bowel. The cure can only be accomplished by gradual dilatation and this may be impossible of accomplishment, and then a colostomy may be necessary.

Bouisson, writing a thesis on malformations of the anus and rectum for a Chair of Clinical Surgery in the Medical School of Paris in 1851, has described 2 cases of congenital valvular stricture affecting Houston's valves which were preserved in the medical museum at Montpellier, preposted by Professor Cabiulil. He also has cited the case reported by Petit where an imperforate membranous septum occurred between the anus and rectum which was punctured on the day after the birth of the child and allowed the escape of a large amount of meconium. Bouisson also cites a case of congenital tubular stricture reported by Sculet in 1640 which was dilated successfully. He also gives credit to Benoit for being the first surgeon in France to recognize the congenital characteristics of these valvular or diaphragmatic strictures. That was in 1847. Bensort invented an instrument to clamp on to the edge of a diaphragmatic stricture which would destroy the tissues by reason of pressure necrosis. Reynier in 1878 called attention to the occurrence of valvular or diaphragmatic strictures of the rectum in adults, in whose history no etiologic factor for inflammatory stricture exists, and in the examination of whom the findings are those which have been described as characteristic of congenital stricture without inflammatory changes in the mucosa. He reports the histories of 7 patients varying in age from fifteen to thirty-two years, and refers to another patient of forty years whose stricture was described by Bouisson. In Reynier's cases 4 had strictures 2 to 3 cm. above the anus, one was 8 cm. above the anus, one was in the middle portion of the rectum, and the last one was at the junction of the middle and superior portion of the anus. The shape of the strictures were optical instrument types of diaphragm or of the valvular type. Due to the fact that symptoms of the constipation or actual obstruction occurred so late after infancy, Reynier assumes that the soft pliable nature of the valvular constrictions was lost in later years and the constrictions became more fibrous. His cases were treated by multiple incisions of the obstructing membrane.

Reclus, one of the few modern authors writing on the subject who has interested himself in the pathology and pathogenesis of rectal strictures, has described 6 cases of rectal stricture occurring in adults from thirty to fifty-two years of age, which he insists were of congenital origin. His basis for such a view was the absence of a history of an inflammatory process in the rectum and the diaphragmatic form of stricture occurring about 3 cm. from the anal orifice. In 3 of these patients he found non-infected "dry" fistulæ with a lining of scar tissue reaching from below the anal opening to a point just below the stricture. Microscopic study showed no inflammatory exudate about these fistulæ, and the pathologist Lebulle expressed his opinion that the fistulæ were congenital in origin and resembled in structure the congenital cysts found in the kidney or liver.

Reclus believes that a diaphragmatic stricture about 3 cm.

from the anal opening, especially when accompanied by a dry fistula, is a congenital stricture. There are certain features about such strictures in adults that are hard to explain on the basis of a congenital malformation. I have seen diaphragmatic strictures in the rectum which I am sure were caused by trauma and inflammation. A toughening and leather-like quality of the mucosa below the stricture, as described by Reclus in one of his cases, results from inflammation. "Dry" or scar-tissue lines fistulæ have been observed numerous times leading from the scarred base of a healed ulcer. Lastly, it is hard to understand why the patients should have symptoms coming on so late in life if the stricture had existed from infancy. These objections, however, are not wholly incompatible with the theory of the congenital origin of some strictures which are first recognized in adult life.

In conclusion we believe especial emphasis should be placed on the development of a megacolon very closely resembling the type described by Hirschsprung in 3 of these cases developing in childhood. While it is probably true that congenital rectal strictures are not responsible for any considerable proportion of infantile megacolon, it is essential in the diagnosis to rule out mechanical factors such as these strictures represent.

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CLINIC OF DR. PHILIP H. KREUSCHER

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UNUSUAL INJURIES ABOUT THE KNEE-JOINT

Three Cases, Each Presenting a Separate and Distinct Type of Injury to the Knee-joint. Treatment in Each Case.

MURPHY said, "An operation upon the knee-joint is one of the most difficult of all major operations."

The knee-joint, because it is a weight-bearing joint, because it has a complicated mechanism, and because of the many structures which are subject to traumatic lacerations and ruptures, is prone to injuries which are entirely incapaciting and very often difficult of repair. The internal ligaments, the semilunar cartilages, the synovial and fibrous capsules, and the patella with its various attachments; one or several of these may be torn, fractured, or deranged in such a complicated manner that one often wonders if ever the joint will function again. To illustrate this fact I wish to present 3 cases of knee-joint injuries of a rarer type, no two alike, but each one a separate and distinct study in the tissues involved and in the method of reconstruction. In each of these cases the incapacity was chiefly one of being unable to extend the leg on the thigh. In each there was no external evidence of a severe trauma except a slight bruising and discoloration of the skin and the distorted contour of the knee-joint. The skin was not broken or punctured in any one of these cases. In one the patella was dislocated downward, in the other it was dislocated upward, and in the third it was dislocated far outward from its usual position.

The first case which I wish to bring to your attention is that of a young man, twenty-eight years of age, who while exercising in the gymnasium suddenly slipped, throwing his full weight upon his right knee, and striking upon the sharp edge of a metal bar. The pain thus occasioned was excruciating, the patient fell over, and was carried from the gymnasium floor. The leg was straightened and very soon the knee-joint began to swell greatly. He was able to flex his leg, but entirely unable to make any effort at extension. He was brought to Mercy Hospital within six hours after the accident.

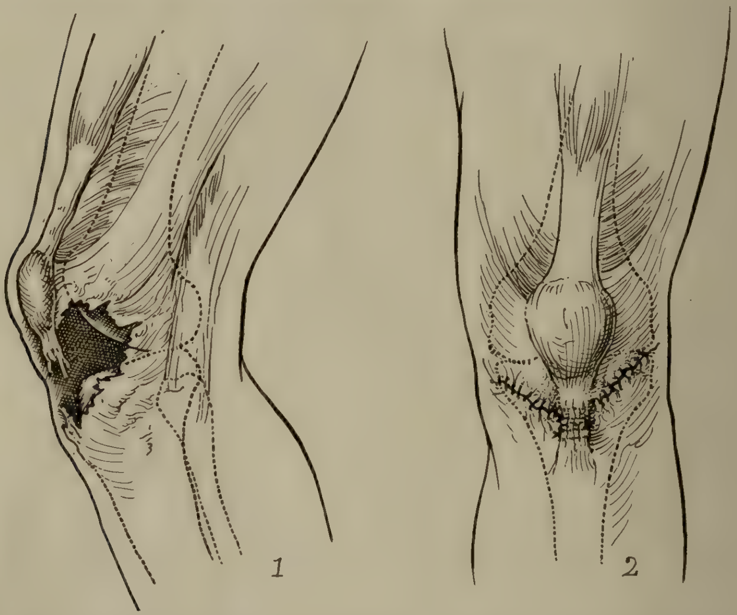

Fig. 476.—Case I. 1, Showing rupture and shredding of the patellar tendon and irregular tearing of the capsule. 2, Anterior view of the repaired capsule and tendon.

Examination with the x-ray revealed that there were no injuries of any of the bony parts about the knee. Further physical examination showed that the knee-joint was entirely filled with a thin fluid, possibly blood. Careful aspiration of this fluid was made, and it proved to be liquid blood. After this fluid had been withdrawn from the knee-joint the diagnosis could easily be made. With the examining finger upon the skin just below the patella one could introduce the finger deep into the joint cavity and outline the semilunar cartilages, which, fortunately, had not been displaced or fractured.

Following the teaching of Murphy that it is unwise and unsafe to perform an open operation upon a joint immediately after accident, I waited for one week until nature had time to throw a cofferdaming about the injured parts and until there was no longer any active bleeding into the knee-joint. I believe in this way we can very frequently avoid infections where otherwise a fresh blood-clot and open lacerated tissues would make splendid culture-media for the bacteria which we know enter every open incision during operation.

At the end of one week I made a semilunar incision, carrying it an inch lower than the line of rupture in the capsule. Obviously this was done so that our line of suture in the capsule and the skin incision should not lie in the same plane. Upon dissecting the skin back I found on examination nothing intervening between the skin and the joint cavity. After considerable difficulty I found numerous shreds of tissue both long and short, some of them attached to the patella and some just attached to the tubercle of the tibia. This was the remnant of the patella tendon (Fig. 476, 1, Case I). The fibrous capsule was torn jaggedly on either side of the patellar tendon, extending inward about 2 inches and outward 1¾ inches. The repair of this proved difficult because I was obliged to gather together the shreds in an effort to make a presentable and sufficiently strong tendon to function in the case of a very large and muscular individual. After the capsule had been repaired and the shreds of tendon brought together the knee-joint was closed without drainage and placed in a straight two-thirds posterior plaster splint with a Buck's extension of about 10 pounds (Fig. 476, 2, Case I).

The wound healed by primary union, and after six weeks the patient was permitted to make an effort at flexion. On the last examination, eight months after operation, the patient could fully extend the leg without the slightest difficulty.

The second case which I present to you is one of a rather similar accident, but in this instance the patella is displaced downward instead of upward. A young man, about thirty-two

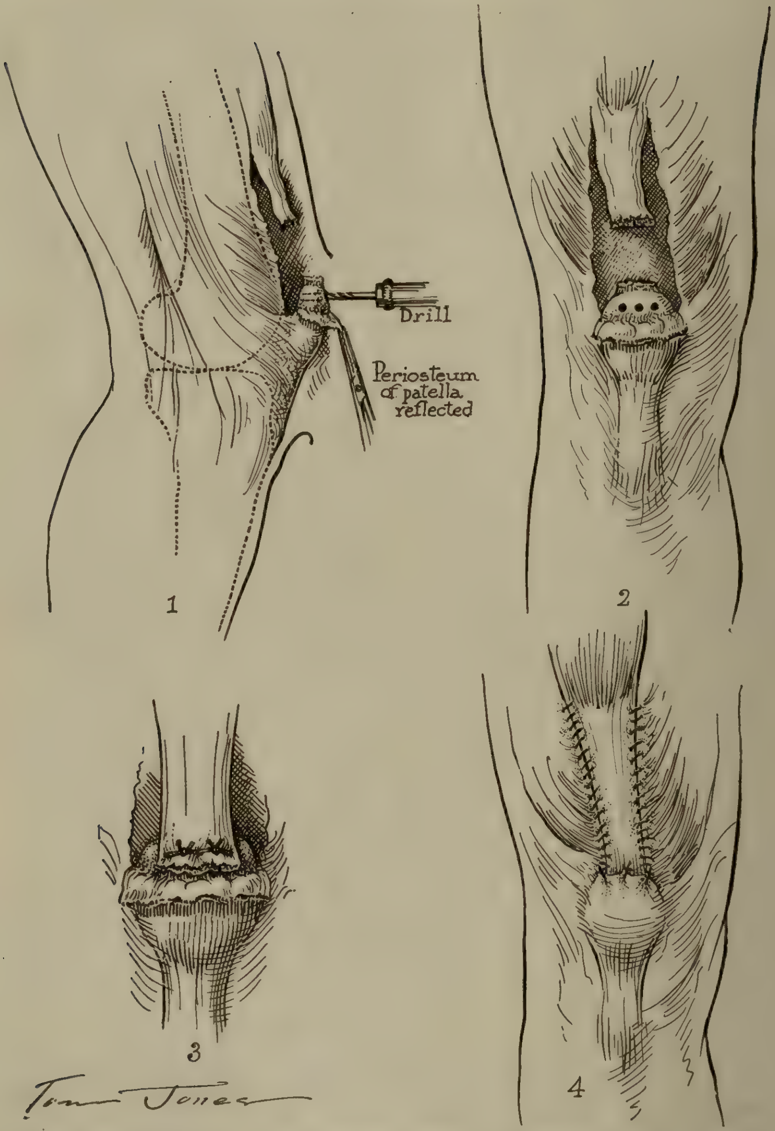

Fig. 477.—Case II. 1, Showing the ruptured quadriceps extensor tendon in a lateral view. The periosteum has been reflected backward and the drill holes are being made into the patella. 2, Showing the tendon and patella prepared. 3, Showing mattress Kangaroo tendon sutures in periosteum. 4, Completed operation.

years of age, was struck by the bumper of an automobile just at the insertion of the quadriceps extensor tendon into the patella. An *x*-ray picture was made, and no bone injury was shown, so a splint was applied and the patient permitted to go about for a period of two months. When the splint was removed the patient had no pain and no apparent deformity, but he was entirely unable to extend the leg. Examination at that time revealed, as in the first case, that there seemed nothing to intervene between the skin just above the patella and the femur. Upon closer examination the stump of the quadriceps extensor tendon could be located 1⅓ inches above the upper end of the patella. It being about ten weeks after the accident, I advised operation at once.

The incision in this instance was a transverse one, so that we would have plenty of room to make a good repair or, rather, the re-attachment of the tendon to the patella. After making an incision through the skin we found that we were immediately in the suprapatellar pouch of the knee-joint (Fig. 477, 1, Case II). The joint contained a very small quantity of a clear fluid, and, of course, we were most careful not to introduce blood or even sponges into the joint cavity. Our next problem was to expose the stump of the tendon, which was not so difficult, but to bring it down to meet the patella proved to be quite a difficult task. I grasped the center of the tendon stump with a heavy vulsellum and attempted to draw it down to meet the patella, but found that I must in some way elongate it at least 1½ inches. To accomplish this elongation I made two lateral incisions parallel and just at the side of the rectus femoris tendon (Fig. 477, 2, Case II). These incisions extended upward a distance of about 2½ inches on the inner side and about 3 inches on the outer side, dividing the attachment of the vastus lateralis and vastus medialis. In this way I was able to bring the stump of the tendon down to meet the patella. The tendons of the lateral muscles were resutured in their new position. To make a nice attachment to the patella I trimmed the stump down so that it could easily be handled with sutures. The patella was then prepared for the attachment by making an incision through its periosteum and deflecting it backward. Then I drilled three holes through the patella from before backward (Fig. 477, 1, Case II), and brought the tendon down, suturing it with kangaroo tendon by several mattress-sutures through openings I had made. The reflected periosteum was then brought back and united to the tendon. This gave us two definite attachments to the patella, one by means of sutures directly on to the bone and the other by suturing the periosteum to the quadriceps (Fig. 477, 3, Case II). By this procedure one had no roughened surface to which the skin might become adherent, and we had not in any way roughened the surface on the joint aspect of the patella. The wound was closed without drainage. A posterior splint similar to that used in the first case was applied, and after seven weeks the patient was permitted to make an active motion of the knee. Examination today shows that the patient can flex his leg acutely on the thigh and can extend it completely with very considerable strength. The knee-joint is entirely stable.

The third case presents a new variety of injury involving tissues not affected in the first 2 cases mentioned. A woman about forty, weighing about 215 pounds, was knocked down by an automobile, having been struck on the outer side of the right leg just above the knee-joint. Examination of this extremity revealed that there had been a displacement of the patella outward upon the external aspect of the knee-joint with the leg in a flexed position. This patient, very much as the second one, was treated in a plaster splint for a number of months in the hope that the tissues would again reattach themselves and permit of normal function.

When she came to the hospital one year after the accident she walked with a cane with the right leg in a knock-kneed position, distinctly flexed, and was unable to extend or further flex the extremity. The examination showed that with great difficulty the leg might have been straightened by force if it had not been for the fact that the patella with its tendinous attachments had become firmly attached on the outer side of the knee, and, of course, would not stretch sufficiently to allow her to straighten the leg. I realized that in such an extensive dislocation the internal portion of the fibrous capsule of the knee and also the vastus medialis attachment to the capsule and tendon must have been severed. To restore these tissues, then, it was necessary to make an extensive exposure of the anterior portion of the knee-joint. This I accomplished beautifully by using a modification of the incision of Trethowen. After exposing the underlying tissues I found that I had been correct in my deductions that the fibers of the vastus medialis had been severed, and that the fibrous capsule had been torn and stretched to such an extent as to permit the patella to lie

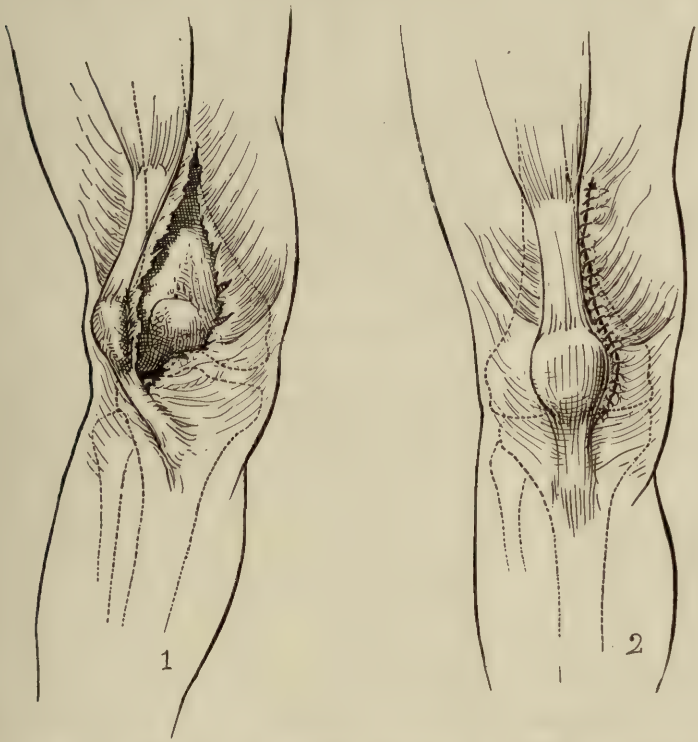

Fig. 478.—Case III. 1, An extensive rupture of the fibrous capsule and the tendinous portion of the vastus medialis. The patella is displaced far out on the flexed knee-joint. 2, Completed operation.

in this abnormal position (Fig. 478, 1, Case III). The repair of these tissues was not as difficult as we had anticipated, but the detachment of the patella and its tendons in the lateral position, where it had become fixed, was difficult beyond our expectations. I found that it was necessary to dissect under the tendon and on the outer side of the patella, in fact, to disconnect a considerable amount of fibrous tissue which had formed, before I could again bring the patella into its normal position between the condyles of the femur. Finally, after having accomplished this, I reconstructed the capsule on the inner side and also the fibers of the vastus medialis. The skin was closed with a small rubber-tube drainage. I felt that drainage was necessary because of the very extensive dissection and because of the capillary oozing which naturally must take place after such an operation.

This patient has a straight extremity and has a good functioning knee-cap which lies in a normal position.

In reviewing the literature on this subject we find very little which gives one an accurate comprehensive knowledge of the processes of repair used by the various operators. There is no one technic which will apply to all cases, one must meet the emergency as it arises. Those tissues which have been torn or detached must be reunited. Those tissues which have been so greatly destroyed as not to permit of reunion must be replaced by some similar material from other parts of the body. If there are not sufficient fibers left of the patellar tendon a portion of the fascia lata may be used as a substitute. If the fibrous capsule is so greatly destroyed that it is impossible of repair, a portion of the same tissue may be transplanted into that portion of the knee-joint.

In conclusion I wish again to call attention to the fact that all these severe injuries occurred without great injury to the skin; that in none of these was there a fracture or injury to the joint; that the repair in each case was possible by simply using our knowledge of the normal anatomic relations of the various tissues and placing them in the position in which they could best function.

CLINIC OF DR. HUGH MacKECHNIE

Postgraduate Hospital

SPASTIC COLON

Patient Showing Clinically Spastic Colitis, a Kinked, Adherent Appendix, and Constipation; no Intestinal Adhesions or Neoplasm. Appendix Removed, Constipation Corrected, and Spasticity Improved.

Miss N. K. complains of pain in upper abdomen on each side, sometimes through to the back, usually coming on from one to two hours after eating. She cannot eat certain foods, such as fried meats and vegetables. Much gas is present after meals, which is very distressing and lasts from one to two hours. Bowels are quite constipated, requiring two or three pills daily to evacuate, and then very unsatisfactorily. She has had no severe attacks or any signs of peritonitis. She was operated on for a cystic ovary two years ago, but otherwise has been rather healthful.

On examination temperature is 98.6° F. and pulse 80. Patient is quite fat, with thick-walled, rounded abdomen. The right abdomen is tense, with marked tenderness at McBurney's point. There are tympanitic and dull areas, the latter predominating. *x*-Ray examination shows some spasticity in the terminal ileum, with a loaded, distended cecum, ascending and part of the transverse colon. The latter half of the transverse colon, splenic flexure, and descending colon are quite spastic. The appendix is bound down and irregularly filled with barium.

Urine examination shows amber color, acid reaction, specific gravity 1020, no albumin, sugar, or casts.

The diagnosis is chronic appendicitis with spastic colitis. Based on past experience in these cases we will operate and remove the appendix, at the same time bearing in mind the possibility of complicating conditions being found.

This case is much like many others which are continually coming up for examination and some for operation. I believe it is a demonstration of the condition in many of our chronic constipation sufferers who appear to be doomed to go through life as semi-invalids after all the usual exercises, dietary regulations, and medicines have failed.

Operation.—I make a midline incision to remove this old scar and because I want to be able to examine the whole colon on account of its spastic appearance. Between the omentum and the abdominal wall you note slight cobweb adhesions which are readily separated. The cecum is brought into the wound with some difficulty because of the adherent appendix. The appendix is quite distended in its proximal half, then constricted, and very small in its distal half. I remove it by the usual purse-string figure-of-8 method, placing one loop around the mesial artery and the other by suture around the base of the appendix. This eliminates the need of a stump ligature for hemorrhage. I think that the ligature and then the purse-string suture are dangerous because there lies between them an infected area which is always a potential abscess. Fortunately nature is strong and overcomes the infection in many cases. Over the purse-string I tie the cut mesocolon to cover the raw surface and to protect the stump. I note here a Meckel's diverticulum about 14 inches from the cecum, which I also remove with purse-string and suture, as in the case of the appendix.

I now pass my hand into the abdomen to ascertain if there are any tumors or adhesions which might produce the narrowing of the lumen of the colon. I find none. The abdomen is closed with catgut and dermal sutures.

Note.—On the fifth day after operation patient had a normal bowel movement, and on the seventeenth day she reported normal movements twice daily.

I want to give you the history and show you the *x*-ray plates of 2 other cases which resemble the above in most details.

The first patient, Mrs. W. H., was admitted to the hospital

June 3, 1922, complaining of severe constipation which required large doses of purgatives daily to produce a stool. She had pain in the right iliac fossa greatly aggravated when she became constipated, headaches of a toxic type, with coated, dry tongue, feverishness, etc. Appetite was always good.

Temperature was 98.6° F., pulse 76, and blood-pressure 130/85. Patient is a well-nourished woman with full, rounded abdomen, with areas of dulness and tympany. She has noticeable tenderness in the right iliac fossa. She had one child five years ago, at which time the perineum was lacerated and repaired. She has had little inconvenience from that condition except with the bladder.

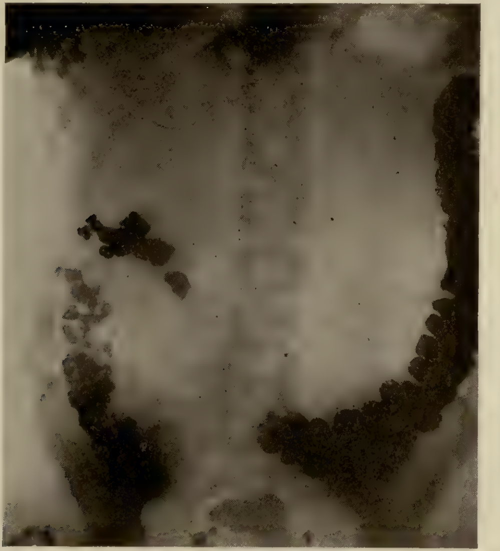

Fig. 479.—Roentgenogram showing marked spasticity in descending colon with some in the proximal half of the transverse.

Skiagraphic examination shows some stasis in the terminal ileum; colon irregularly filled; transverse colon shows marked prolapse; there is spasticity of the descending colon, with only a slight amount of barium therein, and a short tender retrocecal appendix.

The appendix was removed in this case and the abdomen explored for any further evidence of pathology, which was not found. A slight perineorrhaphy was performed.

The skiagraphic plates taken six months after the operation which I show you indicate a decreased spasticity both in intensity and extent. The fluoroscopic report is more favorable than the evidence on the plates. It says, "conclusions in this case are that while there is less spasticity, and that the motility of the meal through the colon is more normal than at first examination, there is still some spasticity, especially in the lower portion of the descending colon and sigmoid. The motility of the meal is slightly delayed, but in general a marked improvement is shown." Her bowels move regularly. She is cured of her headaches and dizzy attacks; also of the backache and toxemia.

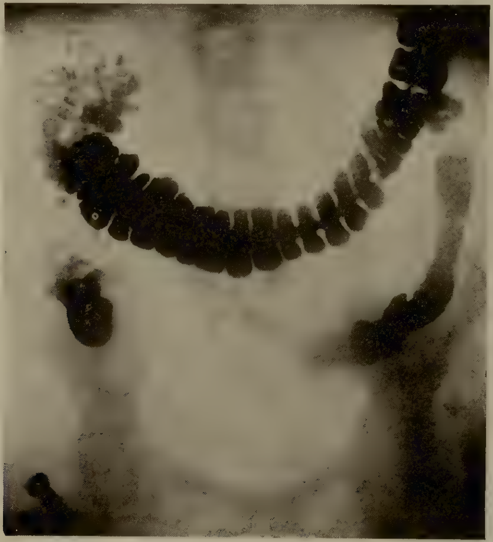

Fig. 480.—Roentgenogram showing decreased spasticity in descending colon with an absence of spasticity in the proximal half of the transverse. The barium is passing the splenic flexure more rapidly.

The second patient, Miss E. S., complained of very severe constipation which required large doses of purgatives daily. She had gone through the list and was growing discouraged.

This constipation came on rather abruptly some two months before, almost coincidently with a slight attack of pain in the right side. She had neither nausea nor vomiting, fever, or other signs of serious trouble. She showed a dry, coated tongue, thirst, feverish feeling, but at no time had she fever. She was losing her appetite, had some belching after meals, and was beginning to have toxic headaches, etc.

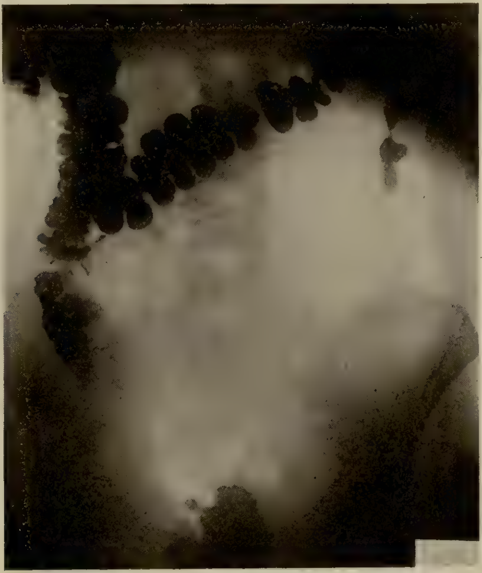

Fig. 481.—Roentgenogram showing spasticity of the descending and sigmoid colon with marked retention of the barium in the transverse colon.

On examination we found a young woman, twenty-three years old, very well nourished, weighing 169 pounds, with a normal temperature and pulse. Tongue was coated white and very dry. Blood examination showed 8600 white cells, 4,500,000 red cells, and 87 per cent. hemoglobin. Urinalysis showed specific gravity 1018, amber color, acid reaction, no albumin, sugar, or casts, a few epithelial cells.

On first examination there was much dulness on percussion, increased rigidity of the right rectus, and moderate tenderness over McBurney's point. As these conditions were frequently found with a loaded cecum and ascending colon, care had to be used in estimating their importance. On the morning of operation with the bowel empty there was slight, if any, increased rigidity of the rectus. On deep pressure over McBurney's point marked tenderness was noted, with stiffening of the right abdomen. It was to be noted that there was no tenderness in the right hypochondriac or in the left iliac regions, but that in the left hypochondrium in the region of the splenic flexure there were tender spots seemingly along the colon tract.

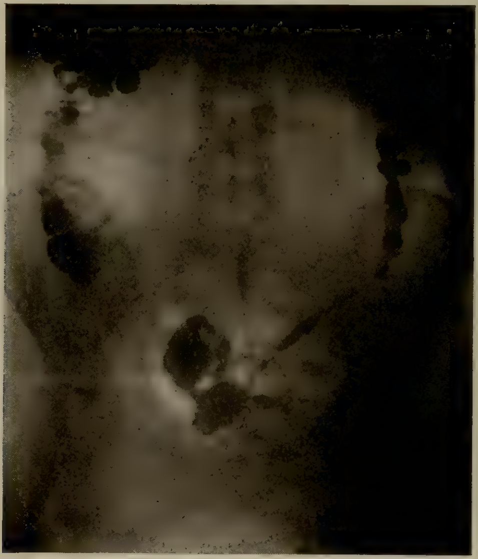

Fig. 482.—Roentgenogram showing decreased spasticity in descending and sigmoid colon with increased amount of barium.

The skiagraphic examination was of interest at this point. The twenty-four-hour examination showed the colon filled and normal in position. Appendix was visible, 5 inches long, not movable, kinked, and not tender (the forty-eight-hour report showed it tender). Cecum, ascending colon, hepatic flexure, transverse colon, and splenic flexure were normal. Descending colon and sigmoid were spastic.

The points of diagnostic importance in this case are tender right iliac region; the sluggish cecum which was loaded an unusually long time; the appendix which showed an indefinite amount of pathology; the very spastic descending colon containing a very small amount of barium, whereas the proximal parts are filled to a normal extent; the rather sudden onset of constipation without any inflammatory process to produce it; the lack of organic or neoplastic conditions to produce constipation; the lack of evidence of fibrous or neoplastic condition in the spastic-like descending colon.

The appendix in this case was removed. It was long, enlarged, distended with barium, bound down, and had an adhesion producing a kink in it. No other pathology was found in the abdomen. You will note from the *x*-ray plates taken after operation which I have shown that there is still a spasticity in the colon. You will also note that the spasticity is not so extensive and that the report from the radiologist is to the effect that it is not so intense as at the preoperative examination. Beyond this objective demonstration is the evidence from the patient that the bowels move regularly without laxative or only with an occasional small dose. But the clearing up of the toxic symptoms, the muddy complexion, circles around the eyes, coated tongue, fetid breath, headaches, etc., as told by the patient, are the most gratifying results of all.

Skiagraphs at the end of a year or more will be much more valuable than those at the end of weeks or months.

This is one of the types of cases for which Lane has been removing the colon. His reason is evidently that the spasticity is due to some intrinsic cause in the colon itself which the removal or treatment of conditions outside the colon will not correct. Even in those early cases where there is no great amount of pathology Lane deems early removal better than permitting the condition to proceed to a serious stage.

Many questions arise in cases of this sort. What constitutes spasticity? How is this spasticity produced? Of what importance is it? How can it be corrected, and why? The consideration of these questions leads on to many more.

What constitutes spasticity? It seems to me that we should define spasticity briefly as a condition of the bowel in which we find both the muscular tissues so affected that some contraction and fixation have taken place producing a decrease in normal muscular activity. This presumes that we know what a normal appearance and the normal movements of the bowel are. Of course we know that this, like many other of our measurements, is relative, and that all examinations should be made by the same man under similar conditions to be approximately correct.

It is not as yet understood why we have this spasticity. It has been suggested that it comes on as a secondary infection following an infection in the appendix, that this infection locates either in the mucosa (bringing on a muscular reflex) or in the muscularis (producing a low-grade myositis with its consequent muscle "splinting"), as is found in myositis in the skeletal muscles.

The small amount of inflammatory reaction together with the lack of evidence of early ulceration in these cases speak against such probability; and yet we should not dismiss it too lightly in view of our knowledge of myositis and neuritis in other parts, which are evidently due to infections, and which are just as quickly relieved, at least clinically, as are these cases, by the removal of the primary focus.

Keith made a study of a number of spastic colons that Lane removed. He found patches of fibrosis in the muscular layer with some decrease of muscle tissue. He also found areas with a slight amount of round-celled infiltration, but none of these coincided with the areas of spasticity. He felt that this infiltration must not be considered as the causative factor of spasticity, but rather a sequence of it. Furthermore, one would scarcely look for the marked immediate clinical relief by the removal of a focus of infection in cases where there was a secondary focus.

Keith puts forth the theory that the spasticity is the result of a stimulation of a specialized neuromuscular type of tissue which is to be found in the areas so prone to spasticity. Following some work on the neuromuscular mechanism of the heart in which he claims he found a node that seemed to control cardiac movements, he began a search for a type of tissue that might be doing a similar work for the complicated mechanism around the ileocecal region. He found such a tissue much resembling Auerbach's plexus. This tissue is also present in the pylorus, in the terminal ileum, and in the descending colon. These are the parts most frequently found spastic. He believes that this tissue keeps the bowel in its normal tonic state, but that under irritation or stimulation it becomes hypertonic and a spasticity is produced. It is possible that this tissue may be the center through which the impulse derives its origin, and that the impulse is carried over to other similar tissue at distant points to produce the same hypertonicity that is produced through itself. This is rather acceptable because in most of these chronic appendix cases there is a spasticity in the colon and also at the pylorus. It is quite probable that this same tissue is the factor producing a pyloric spasm and antiperistalsis resulting in nausea and vomiting at the onset of acute appendicitis.

I think we must add to this autostimulation and reaction of Keith a still further point, viz., a reflex through the splanchnic system. An irritation in the appendix and possibly of the ileocecal collar of Auerbach's tissue sends an impulse through the superior mesenteric branches to the celiac plexus, and from there an impulse is sent to the Auerbach tissue located in the descending colon and the pylorus. The resulting stimulus produces a hypertonicity of these parts and the contraction is produced. The apparent selective action in these reactions is readily explained by the similarity in type of tissue in the areas in which spasticity is found.

Having present such a spasticity, of what importance do we find it? A reference to the patients seen in daily practice suffering from constipation with toxic headaches, etc., is our answer. A study of the work of Lane, who has done more than any other, shows the number and type of conditions that appear to arise from the toxemia incident thereto. If we accept the work of Lane and his associates, we are at once struck with its importance. Mutch has shown the various types of bacteria present with the fermentation products at different points in the intestinal canal.

How can this all be relieved? To say that removal of the appendix is sufficient will bring disappointment many times. I think that it will be very gratifying in many cases. It may be that other conditions may produce the syndrome. It may be that pyloric ulcer with pain may produce it, or cholecystitis or pyosalpinx or other inflammatory process. Whatever effect these may have as causative factors I do not know, but in several cases it has seemed that the removal of the chronically inflamed or deformed or irritable appendix was a factor. The skiagraphic pictures shown are only partial proof of the results. Clinically all of these cases have shown marked improvement, passing from the stage of requiring 2 to 5 pills a day to that requiring none to produce one or two natural movements daily.

CLINIC OF DR. EMIL G. BECK

NORTH CHICAGO HOSPITAL

TUBERCULOUS LYMPHADENITIS; ITS SIGNIFICANCE AND SURGICAL TREATMENT

Discussion of Pathology, Diagnosis, and Treatment of Tuberculous Lymphadenitis. Presentation of 4 Cases.

IN reviewing the development and changes in the treatment of tuberculous glands in the neck one is impressed by the fact that twenty years ago we witnessed in our surgical clinics so many surgical operations for the removal of tuberculous glands, whereas at the present time we see such procedures only occasionally.

I remember that in my school days we witnessed in almost every surgical clinic extensive resections of the glands with exposure of large blood-vessels, the operation sometimes lasting two to three hours. Recurrence of the disease was not very infrequent, and the scars which remained after these extensive operations were rather common and very unsightly. Why do we not see so many at the present time? Has surgery failed or is the disease less prevalent? It is quite possible that the removal of tonsils in early childhood, which is now practised so extensively, is one of the preventive measures against enlarged glands in the neck.

The gradual and chronic enlargement of glands is not to be regarded as a disease *per se;* it is a secondary infection, the primary focus of which is usually in the mucous membrane of the upper respiratory tract, the tonsils, the teeth, and sometimes the accessory sinuses of the nose. The enlargement of the glands is not always of tuberculous origin, and when the infection is acute the glands are only temporarily enlarged and recede as soon as the primary acute affection has subsided. In the chronic and persistent infections, such as tuberculosis, the glands do not return to normal size, but have a tendency to increase in size and in number. In time they may become caseous and finally suppurate.

The suppuration may cause an abscess within the gland which works to the surface and may rupture spontaneously or may be incised by the surgeon and drained. In either case a spontaneous closure may take place; at times it may require medical or surgical intervention.

We have all noticed that some children around the age of three to six years, sometimes several members of the same family, have a slight enlargement of the glands back of the sternocleidomastoid. These glands may or may not be of tuberculous origin. We have seen them gradually diminish until at the age of ten or twelve years they have entirely disappeared without having reached any abnormal size or having progressed to the stage of suppuration. What has become of these glands? The infectious process has receded and the glands have returned to their normal anatomic size. The progress of the disease or the return to normal seems to depend on one factor, namely, *immunity*.

If an individual is able to produce sufficient antibodies to overbalance the disease the glands will disappear spontaneously, providing they have not reached the stage of suppuration. We may regard the infected gland as a factor in immunization—a sort of a laboratory for the formation of immune bodies. This explains to a certain degree why so many people who have lived through the acute stage of infection remain free from symptoms after a sufficient time has elapsed. This may be illustrated in cases of spontaneous recovery from pulmonary tuberculosis. Evidence of the disease having existed may easily be demonstrated in stereoroentgenograms of the hilus of the lung. We find in almost every individual over twenty-five years of age some evidence of a glandular enlargement—shadows in the hilus of the lung, and in many instances we find also deposits of calcium salts. The permanent scar tissue and the deposit of the calcium salts give a definite shadow. This does not mean that there is any disease actively operating in the glands of the hilus. It simply means that the disease had previously existed from which the patient has recovered.

Some ten years ago I convinced myself of this fact. I selected 12 healthy nurses in our Training School, and took stereoroentgenograms of their chests. In not a single case did I find the hilus free from glands. The deposits of calcium in the glands signify that the particular individual possesses considerable immunity against tuberculosis.

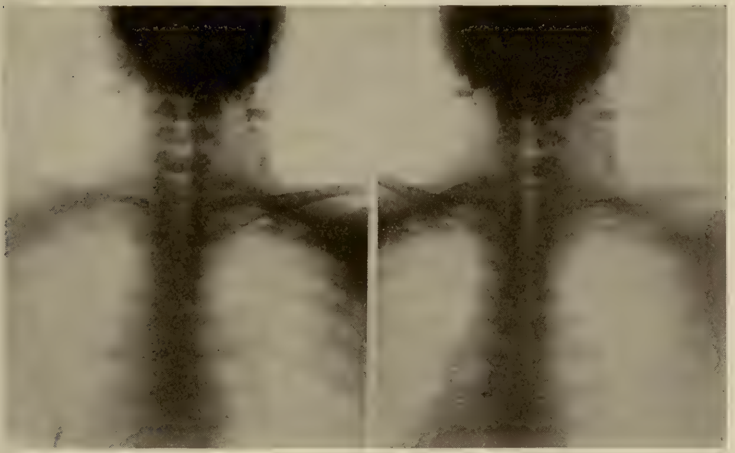

Fig. 483.—Stereoscopic roentgenogram: Calcified glands in the neck not operated upon.

I will demonstrate here by a graphic illustration to what degree this calcification may go. In Fig. 483, a stereoroentgenogram, I show a bilateral enlargement of the glands of the neck in a lady of thirty-five years. You will note a group of glands on either side so well defined and so distinct as to resemble a chain of beads, some being as large as a small-sized walnut. She presented herself for surgical operation some ten years ago. After stereoroentgenograms were taken, showing the amount of calcification, I advised against operation, if she did not mind the deformity in her neck, because her health was unimpaired.

I have observed this case for the past ten years, and up to the present time there has been no change in her condition either in the glands of the neck or the lung. This leads me to say a few words on immunity.

Immunity.—Every individual is born with a certain degree of immunity against disease. The degree of this natural immunity varies not only in different individuals, but in different stages of their lives. If there were no immunity whatever at birth, the child would be likely to succumb from the inhalations of its first breath of air, for it contains various types of pathologic micro-organisms which would find a very suitable soil in an unprotected individual. Besides this natural immunity each individual gradually acquires an additional immunity during life. If, for instance, a person is stricken with typhoid fever and recovers, he will possess an immunity for this disease for a long time. This acquired immunity differs with the different infections and gradually diminishes, and in some diseases, such as smallpox and mumps, is permanent, while in other diseases, such as measles, scarlet fever, etc., the immunity lasts but a short period.

The body may also be immunized artificially by vaccines or serums, a method well known to all of us.

We have thus three types of immunization:

(*a*) Natural.
(*b*) Acquired.
(*c*) Artificial.

Tuberculosis has a great tendency to immunization of the body because the disease is so prevalent; if it were not for this tendency all, once affected with tuberculosis, would die from the disease. The human race would soon be extinct, for we know that almost every individual has once in his lifetime been afflicted with tuberculosis. He may have been so slightly affected and the process have been so gradual that the individual was not sufficiently ill, and did not even know that he had the disease; nevertheless these repeated small doses of infection produced a pronounced immunization without the patient's knowledge.

Pathology.—Tuberculous glands are not confined to the neck, but they are so prominent in that region that our attention is called to them by the patient himself. They are more frequent in the hilus of the lung than any other part in the body. They are present in the mediastinum, in the mesentery of the intestines, in the groin, and in the axillæ.

The infection travels through the lymphatic channels from gland to gland, a proliferating process being a factor in producing the enlargement. Giant-cell formation and tubercles gradually form and the interior of the gland may go on to caseation. The capsule of the gland becomes infiltrated and thickened and finally fibrous. If suppuration takes place, the gland will become adherent to the overlying skin, slight reddening of the skin will appear, softening and fluctuation will take place, and the abscess may rupture spontaneously. The contents may contain living tubercle bacilli and other micro-organisms; at times the pus is sterile and is regarded as a cold abscess. Living tubercle bacilli are present in the walls of the lining of the capsule.

Differential Diagnosis.—Enlarged glands in the neck are by no means always of tuberculous origin. Temporary enlargement is not unusual in simple cases of tonsillitis. The adenitis which very often follows measles, scarlet fever, etc., usually recedes within thirty days after cessation of the symptoms of the disease. When glands in the neck develop gradually and slowly, and keep on increasing or remaining stationary, we may suspect that they are of the tuberculous type, although there are other diseases that will produce the stationary enlargement.

We eliminate the following possibilities:

(*a*) *Multiple Sarcoma.*—This condition is not usually confined to the neck. One will find the enlarged gland all over the body, especially in the lungs. The patient's general condition will help in differentiating it from the tuberculous gland of the neck. Radiographs of the chest will demonstrate multiple sarcomata as round, well-defined bodies scattered all through the lung and not in the hilus like tuberculosis.

(*b*) *The Non-tuberculous Infection or Gland Due to the Infection of the Nose, Throat, or Teeth.*—The non-tuberculous glands in the neck resemble very much the tuberculous type, and at times the diagnosis is almost impossible except with the aid of microscopic examination.

(*c*) *Hodgkin's Disease.*—This affection has in its incipiency very often been diagnosed as tuberculosis; but when progressive it is seldom taken for tuberculous glands. The enlargement is not confined to the neck as a rule. The armpits and the lungs as well as the spleen are very often the seat of very large tumors. Hodgkin's disease is a progressive disease, always terminating fatally within three to five years. The tumors are very much harder, never undergoing suppuration or caseation, unlike the tuberculous glands. The tumors are not as a rule separated, but adherent to one another, something like a large fibroid of the uterus. A microscopic examination of the tissue removed from a case of Hodgkin's disease markedly differs from that of a tuberculous gland, and a diphtheroid bacillus may be cultured from Hodgkin's disease.

(*d*) Small cysts (sebaceous) or small multiple lipomata are not likely to be mistaken for tuberculous glands, because their consistency and location differ so much from the tuberculous type of lymph-glands.

Treatment.—The present-day treatment differs very much from that of the past. Surgeons do not decide as readily upon the removal of the tuberculous glands of the neck as they did twenty years ago. Only three times during the past ten years have I resorted to their resection in a large series of cases. The course of procedure depends largely upon the stage of the disease and its extent.

(*a*) Enlarged glands in the neck which are of recent origin, where the infection has been of an acute character, should for a time be left alone, as they will, as a rule, recede in a very short time.

(*b*) If the enlargements persist, or when the glands keep on growing larger, treat the focus from which the infection came. The teeth should be examined by a competent dentist with the aid of radiographic pictures. The nose and throat and accessory sinuses should be examined by a rhinologist. The tonsils and any disease in any of them should be eliminated prior to any treatment upon the glands themselves. We should wait long enough and watch the decrease of the glands. If they do not decrease, then it is best to resort to deep therapy by means of *x*-ray or radium, and this should be done by a competent roentgenologist and not in a haphazard way.

Tonsillectomy especially is indicated when the tonsils appear abnormal. In many instances the glands in the neck have disappeared after the tonsils were removed, and no other treatment was supplemented.

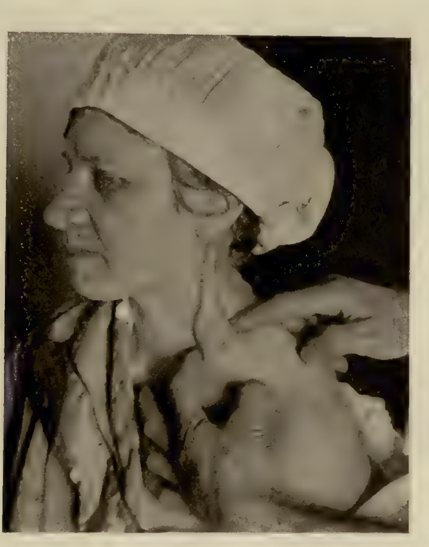

Fig. 484.—Keloid scars subsequent to operations for tuberculous glands.

(*c*) Should the glands undergo caseation or suppuration, then it is best to make a very small incision, "a stab wound," into the gland under local anesthesia, eliminate as much as possible of the cheesy mass or the pus, and inject the cavity with a 10 per cent. *bismuth paste*. If the gland does not reduce in size perceptibly, it may be necessary to resort to its resection. In such a case the wound, if not too large, should not be sutured. Instead of closing the cavity by suturing, as we did in previous times, the cavity should be left open and packed with gauze for twenty-four hours. Upon removing the gauze the edges of the wound should be firmly approximated, not by sutures, but by adhesive plaster. By such procedure the scar is likely to be less prominent and there will be less tendency to keloid formation than by suturing.

(*d*) In cases where the glands have already ruptured or have been incised and drained and sinuses persist, the best treatment is the *injection of bismuth paste* into the sinuses. Most of them will close up without surgical intervention. The scars after the sinuses have healed are surprisingly insignificant.

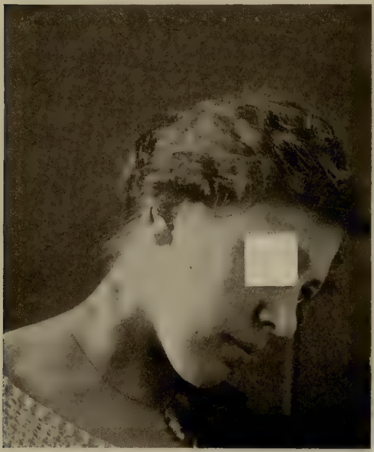

Fig. 485.—Tuberculous glands (fluctuating).

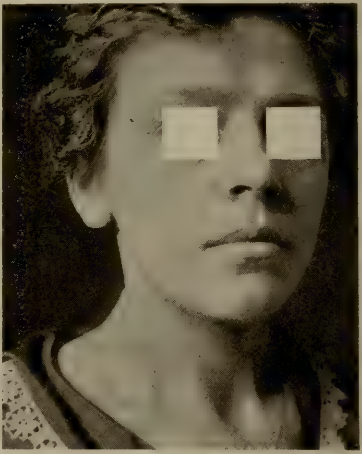

Fig. 486.—Complete disappearance of glands after puncture and injection of bismuth paste.

This method is so well known that it is not necessary in this paragraph to describe it in detail. I will, therefore, refer only to the recent articles written on this method, and especially the one in the text-book *Surgical Diagnosis* by Ochsner.

(*e*) Cases which have already been operated upon and bear large unsightly scars, sometimes of keloid character, with contractures, can be successfully treated by a plastic operation (Fig. 484). A resection of the scar tissue and the coaptation of the wound edges by subcutaneous silkworm-gut sutures is the first step. The skin edges should then be brought together with very fine horsehair sutures, but these should include only the very border of the skin edges, and not include the entire thickness of the skin; merely enough material should be caught to keep the edges together sufficiently long to produce adhesion.

For illustration of the various procedures I cite one of each variety.

Glands Already Undergone Closed Suppuration.—*Case I.*—A lady of twenty-six years developed glands in the right side of the neck in the year 1914. I saw her during the first of 1917 (Fig. 485). These glands had at that time evidently undergone a cheesy degeneration and there was some fluctuation in one of them. Instead of extirpating these glands at once, a very small incision under local anesthesia was made in the center of each gland. The pus was allowed to escape and the cavity was then injected with 10 per cent. bismuth paste. This was supplemented with *x*-ray treatments, and within six months there was practically no evidence of any glands and just a minute scar which did not even require suturing in the region of the incisions (Fig. 486).

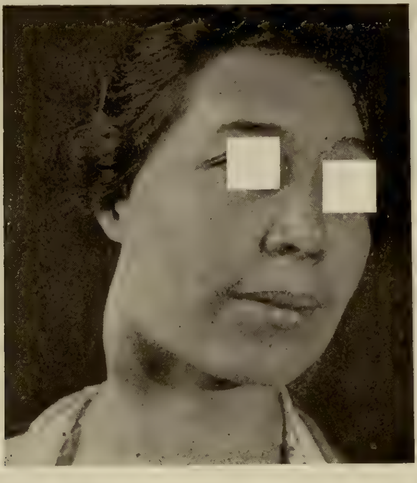

Fig. 487.—Tuberculous glands requiring resection.

Case in Which Resection Was Necessary.—*Case II.*—Mrs. F. H., aged thirty-one, presented herself in October, 1921, with a tuberculous gland in her neck, as shown in Fig. 487. There was a slight softening in the center. A small incision was made, but very little pus escaped; the small cavity was injected with bismuth paste, but the reduction in the size of the gland was not satisfactory; there must have been a great deal of solidified cheesy mass and some of the gland substance left within the capsule. The patient was unwilling to undergo protracted treatment, and it was decided in January, 1922 to resect the gland. This was done, but instead of suturing the edges of the wound, the cavity which was left from the removal of the gland was packed with gauze, and the same was removed twenty-four hours later. A keloid scar, however, did form, which was treated surgically one year later.

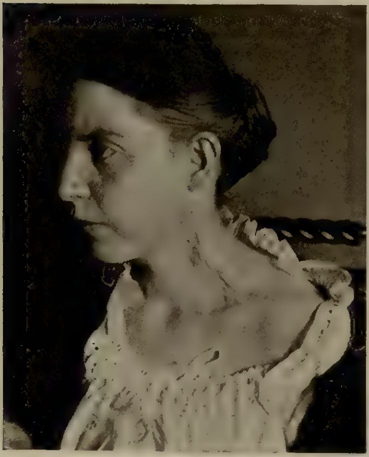

Fig. 488.—Keloid and scar tissue subsequent to operations.

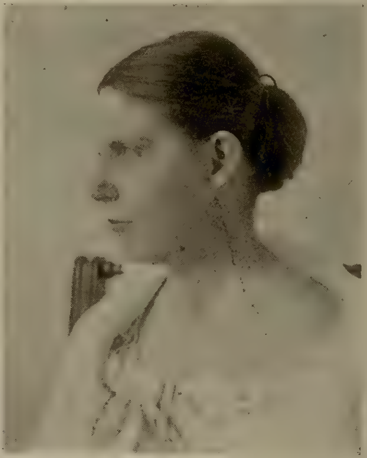

Fig. 489.—Plastic operation with subcutaneous suture and supplemented by fine horsehair.

Treatment of Postoperative Scar and Contracture.—*Case III.*—Mrs. J. F. at the age of twenty-five developed tuberculous glands on both sides of the neck, quite an extensive growth on the left. She was operated by her physician three times in a period of two years; each time a recurrence of the glands took place. These operations left very heavy keloid scars in the left neck with contractures of the head as shown in Fig

468. After two years of general treatment, which included resection of ribs for tuberculosis, her general health improved, and we decided on a plastic for the scar. She was operated in 1913. It is always necessary to excise the scar completely beyond the border of infiltration, so that perfectly normal skin shall constitute the edges of skin which are to be united. Instead of putting in a running suture, we use a subcutaneous silkworm-gut, inserting the suture rather far away from the edges, so that the skin proper is only approximated. The skin edges proper are then united by interrupted horsehair sutures. These sutures should not penetrate the entire thickness of the skin, only the most superficial layer. The stitches must be placed very closely together. These sutures will hold the skin edges in apposition for adhesion and drop out in two to three days, leaving practically no scar. This is illustrated in Fig. 489. After ten years there is not much more than a linear scar left and the neck is freely movable.

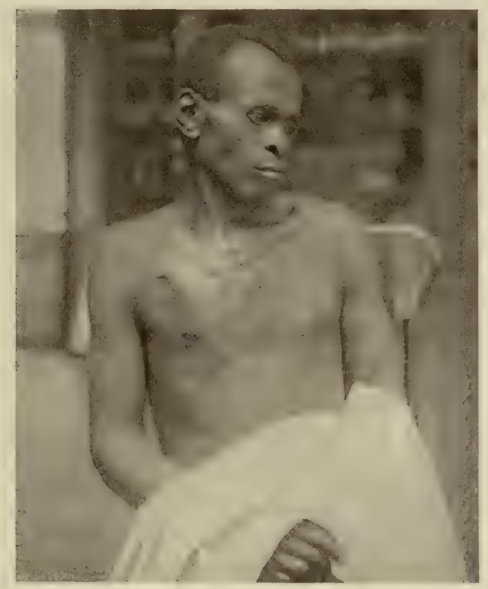

Fig. 490.—Tuberculous glands in the neck and the sternum.

Case in Which Suppuration with Sinuses Had Persisted.—*Case IV.*—A colored man, admitted in 1913 into the Municipal Tuberculosis Sanitarium, had for years suppurating glands in the region of the neck and chest (Fig. 490). Some of these sinuses were the result of tuberculous osteomyelitis of the sternum and ribs, others from diseased glands in the supraclavicular region. The case was treated by bismuth injections alone, and after two month's treatment the sinuses closed and have remained so.

In most cases of this kind where the sinuses originate in bony structures it is necessary to remove the diseased bone before we may expect any results from the bismuth treatment. In this case, however, the sinuses closed without surgical intervention.

CLINIC OF DR. CAREY CULBERTSON

Cook County Hospital

VAGINAL HYSTERECTOMY COMBINED WITH COLPOVESICORRHAPHY AND COLPOPERINEORRHAPHY

History of Present Case. Diagnosis: Fibroid Growths in the Wall of the Uterus and Possibly a Submucous, Pedunculated One. Conditions to Be Differentiated. Operation: The Schuchardt Incision in Vaginal Section; Colpovesicorrhaphy and Colpoperineorrhaphy. Advantages of Method Employed.

In a previous clinic[1] extirpation of the myomatous uterus by abdominal section has been described, together with remarks on differential diagnosis and ovarian conservation. At the present time I desire to present a case wherein conditions are suitable for hysterectomy by the vaginal route.

The patient is a widow, thirty-four years of age, waitress by occupation, who enters the hospital complaining of the following symptoms:

Prior to February, 1922 her menstrual periods, which began at thirteen years of age, were regular every twenty-eight days and of seven to eight days' duration. She flowed freely, with moderate dysmenorrhea, but at the time stated suffered a profuse flow, characterized by clots and cramping pains which lasted for ten days. One week after the cessation of this discharge a similar hemorrhage occurred. There had been no preceding amenorrhea and the patient states that pregnancy was out of the question. Since that time she has been subject to intermittent bleeding from the vagina, with clots and pain, and this has become more profuse and continuous during the past three months. In other words, during the past eleven months there have been no regular menstrual periods, but irregular intermittent bleeding.

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[1] Surgical Clinics of Chicago, vol. 4, p. 1211.

In addition, the patient complains of constipation and frequency of urinaton. Leukorrhea has been noticed at times, but never sufficient to cause annoyance, and not noticeable recently.

She has had 2 children, seventeen and fifteen years old respectively, and 2 abortions in the early weeks of pregnancy. The labors and abortions were spontaneous, necessitating no operative procedures. In other respects she has had no illnesses since those of childhood except an attack of influenza in 1918.

Examination reveals a woman short in stature and obese, with soft and flabby tissues. The thyroid gland is not palpable; the heart and lungs are normal; blood-pressure consistently low, systolic never more than 118, diastolic 78.

The blood shows no decrease in coagulability; leukocytosis 6800; hemoglobin estimation 85 per cent.; the urine shows no albumin or casts and no sugar; the temperature has shown no elevation above normal during the week the patient has been under observation; the Wassermann test is negative.

The abdomen is obese, protuberant, relaxed and pendulous, with diastatic musculature. There are no palpable masses and no tender points.

The vaginal introitus is moderately relaxed and gaping, with a small rectocele and some degree of prolapsus of the anterior vaginal wall, permitting descensus of the bladder and a straightening out, or sagging, of the urethra. The vagina is deep, but not distensible, being in a measure constricted despite the outer relaxation. The cervix is multiparous, but closed and small, and it points down and back toward the hollow of the sacrum. The corpus uteri is enlarged, hard, and asymmetric, its anterior wall appearing to bulge into a rounded prominence. Altogether the uterus is the size of a three-months' pregnancy. It lies in the left and posterior portion of the pelvis and is very freely movable. The appendages are apparently normal.

In view of the symptoms complained of and of the findings as described, we have made a diagnosis in this case of fibromyoma of the uterus, complicated by a moderate degree of perineal relaxation. Our idea is that there are one or more small fibroid growths in the wall of the uterus and possibly a submucous, pedunculated one. It is entirely possible, however, that we have here a case of chronic subinvolution, or fibrosis uteri, producing the so-called essential, or myopathic, hemorrhage. Mucosal changes, such as the development of polypi or diffuse hyperplasia, may also have occurred.

Other conditions which must be considered in differential diagnosis are incomplete abortion, ectopic pregnancy, general systemic disorders, and malignancy. Though not impossible, it is scarcely probable that abortion or extra-uterine gestation has produced symptoms for so long a time as eleven months. Examination shows no evidence of cardiac or cardiovascular changes, nephritis, pulmonary or hepatic disease, and like conditions. Carcinoma or sarcoma is, of course, a very possible cause of the uterine hemorrhage, though by this time it should be accompanied by a foul, watery discharge, and other evidence of malignancy. Indeed, the differentiation could be very easily made by a preliminary curetment if one thought carcinoma the most probable condition presenting in this case.

At the present day the surgical treatment of small uterine fibromyomata, or of fibrosis uteri, lies between the application of radium and ablation by either myomectomy or hysterectomy. The subjection of the uterus in this case to 1500 or 2000 millicuries would no doubt be the simplest method of stopping the bleeding, and were the patient ten or fifteen years older I should regard radiotherapy as preferable to other operative procedure. The introduction of radium is but a minor surgical procedure, requiring simple dilatation of the cervix and a light anesthesia for a few minutes. Moreover, radium is effective in checking or controlling uterine hemorrhage in a large proportion of cases. On the other hand, its action is destructive, at least temporarily, to the ovarian function, an undesirable result in a woman the age of the patient under consideration. In addition, the effect of radium on the tumor is often only temporary, and cases are now reported in which radium has been used and in which some time later bleeding has again occurred and the tumor has renewed its growth. In my own experience I have seen 2 cases, both in young women, in which the hemorrhage did not cease until three months after the introduction of the radium, only to return, with dysmenorrhea, after five and six months, respectively. It would appear, therefore, that radium is best applicable to uterine hemorrhage in cases in which the patient's condition is such as to render operation inadvisable or in which she is forty-five or more years of age. In the present instance the patient is a poor woman who has to work for her living and that of her children, and she desires to return to her work as soon as possible and as permanently cured as possible. I have, therefore, elected to treat her by removal of the diseased organ.

With the patient anesthetized and prepared for operation in the perineal position I desire to examine her again before final decision as to the choice of route for operation. In any event we shall have to perform anterior colporrhaphy and colpoperineorrhaphy. The uterus is found to be definitely enlarged, hard and free, and I can make out no thickening or fixation about the appendages which indicate adhesions. The uterine fundus does not rise above the plane of the pelvic inlet and the anterior wall contains a somewhat rounded prominence. The cervix, while not thickened, is rough, and through the speculum is seen to bear a follicular erosion. The sound, passed into the uterine cavity, shows a depth of 5 inches, fully twice that of the normal nulliparous uterus.

The conditions for vaginal hysterectomy are chiefly three: (1) That the uterus be not too large; (2) that it be not too fixed by adhesions or infiltration of surrounding tissues, and (3) that it be not malignant. As far as enlargement of the uterus is concerned, many abdominal hysterectomies are performed where the organ is altogether suitable for extirpation by the vaginal route. A uterus two or three times its normal size need be no contraindication for vaginal removal. It is preferable, of course, that no adhesions be present, but light bands or veils that can be readily broken up with the finger and that are not vascular prove to be little or no hindrance to extirpation from below. Only when adhesions are dense enough to produce fixation, as in general pelvic peritonitis or pyosalpingitis, or when the parametrial tissue is densely infiltrated, is vaginal hysterectomy contrainicated. I aim to avoid the lower route in every case where I believe there has been a suppurative process.

Many operators regard a narrow vagina as a contraindication; only where this constriction constitutes an actual stenosis is operation impossible, or at least unwise. Enlargement of the vaginal tract by paravaginal section solves this problem satisfactorily in the ordinary case.

The advantages of operating by the vaginal route, as compared with the abdominal, lie chiefly in the lessened reaction to the procedure on the part of the patient. In the hands of skilled and experienced operators the greater technical difficulties met in the vaginal route are overcome in a measure. But where these are sufficient to prolong unduly the operation the danger of infection is increased and the abdominal route becomes preferable. These difficulties are due chiefly to enlargement of the uterus, as in fibroid growths, and to adhesions. Where the uterus is so enlarged as to require extirpation by morcellation or where the adhesions are such as to leave raw areas necessitating peritonization, the abdominal route is the only logical one. Tumors of the appendages, particularly ovarian cysts, also produce conditions favoring abdominal section.

Vaginal Section: The Schuchardt Incision.—In this particular case we have, then, a uterus somewhat enlarged, but free, and a vagina somewhat constricted in its upper portion. In order to insure ease and, therefore, speed in work I shall first enlarge the vaginal canal. With two fingers depressing the perineum the left labium is put on the stretch and divided with the scalpel between its mid and lower thirds. The incision is carried up the vagina along the junction of its lateral and posterior walls, thus splitting the canal as deeply as desirable, to the vault if necessary. In this case I have stopped somewhat short of the cervix. On the skin surface I now continue the incision in a curve outside of and encircling the sphincter ani on its left, until the lower angle of the wound reaches a level with the posterior anal margin. I estimate this to be sufficient in extent for the purpose of the present case. The entire incision is now deepened until the inner surface of the canal of the levator ani and the pararectal space is exposed. Bleeding points, which are not as profuse as one might anticipate, are clamped and ligated.

Paravaginal incision is an extremely helpful procedure, as is now evident, for I am thus enabled to reflect the rectum and anus posteriorly and to the right, thus giving adequate room for the work to follow. It is, in effect, an extended episiotomy wound, going higher, deeper, and farther out on the skin surface. When carried to its fullest extent, as originally devised by Schuchardt and developed by Schauta and others, the incision extended from the vaginal vault, through the labium and out around the sphincter ani area to the coccyx. It then divided the vaginal canal, left labium, skin of the perineum, lateral anal region, superficial fascia, bulbocavernosus and transversus perinei muscles, lower part of the triangular ligament, paravaginal and pararectal tissues, outer fibers of the levator ani muscle near the sphincter ani and coccygeal attachments, and the cellular tissues of the ischiorectal fossa. It passes below the vestibular bulb and the Bartholin gland, and cuts branches of the perineal and inferior hemorrhoidal vessels. These bleeding points are readily accessible for ligation, as has been seen. Very little more dissection, as when I separate the vaginal vault from the posterior lip of the cervix, will bring into exposure the peritoneum and parametria. This incision, as employed today, is of value chiefly as an aid in hysterectomy and in the closure of extensive urinary fistula, the latter indication having been recognized to advantage by Ward and Corscaden.

A gauze dressing is laid over the wound, and a hanging speculum is placed in the vagina. With two vulsella the cervix is now grasped, both lips together, and traction is made. It is seen that the cervix comes well down toward the introitus, so that the entire anterior vaginal wall is exposed. Here the lower portion pouches forward, permitting the urethra to straighten out and the bladder to prolapse in a moderate degree. Inasmuch as the pelvic floor is to be weakened by removal of the uterus, the relaxation will be treated as for cystocele. Mild degrees of relaxation of the anterior vaginal wall are often taken care of by posterior fixation of the cervix, as when ligamentopexy is performed for uterine retroversion with or without descensus, and by adequate perineorrhaphy. When, however, slight relaxation is in danger of being increased, anterior colporrhaphy and cystopexy, or colpovesicorrhaphy, as the procedure is also called, becomes necessary.

Anterior Colporrhaphy.—With the cervix uteri drawn well down I pick up the anterior vaginal wall with a vulsellum 0.5 cm. behind the urinary meatus. From this point I cut through the vaginal wall in its median line, directly back toward the cervix and as far as the vaginal reflection on the cervix. Here the line of incision is deviated and made to encircle the cervix, passing about it first on the left, then on the right side, the two semicircular incisions meeting on the posterior cervical wall. I now undercut the edges of the mesial portion of the wound along the anterior vaginal wall, first on the right side, then on the left. These edges are grasped in the bite of small clamps, two on either side placed equidistant, and given to the assistants. With a small gauze sponge I bluntly dissect the vaginal wall on either side away from the bladder, cutting with the scissors such fascial bands as resist. I take pains to keep as close to the vaginal mucosa as possible, so that all fascial tissue is left attached to the vesical wall. In this manner the bladder is mobilized extensively and the dissection carried forward beneath the vesical neck and urethra.

Posteriorly the cervical attachment of the bladder is exposed by the reflection of the vaginal flaps which are now held widely apart by the assistants. For the present no excess of vaginal mucosa is removed. The denser fascia uniting cervix to bladder is cut through with the scissors, after which I am able to wipe the bladder away from the cervix with gauze, until the peritoneum is exposed in midline, and the broad ligaments laterally. Further separation of the bladder from its pillars and the vesico-uterine ligaments is done with the scissors, keeping the vaginal mucous flap as thin as possible, until laterally the structures become denser and dissection may again be blunt.

As has been demonstrated in this case, mobilization of the bladder, far from being difficult, is readily carried out. The tissues are seldom very vascular; such oozing as has occurred will be taken care of by the suturing that is to follow. Occasionally a spurting vessel will have to be ligated. Where bleeding is free it is usually venous and can be controlled temporarily by hemostatic forceps. A light gauze dressing is now placed in the wound behind the symphysis. This permits exposure posteriorly, and here the vaginal wall, already cut through, is stripped away from the cervix until the peritoneum of the posterior culdesac is exposed. Owing to the fact that the tissues of the posterior vaginal wall are more vascular this portion of the incision may be deferred until the present stage of the operation.

Hysterectomy.—The cervix is still held beneath the symphysis, the peritoneum has been exposed anteriorly and posteriorly, the vaginal walls have been freed from the cervix laterally, and we are now ready to extirpate the uterus. This is done in the following stages:

1. *Opening the Pouch of Douglas.*—With a tissue forceps in the left hand I pick up the exposed peritoneal fold and pull it away from the cervix. With the scissors this is now snipped through carefully, and the incision is extended on either side to the broad ligament. This incision should be made with a sharp instrument and not by tearing with the finger. A ragged peritoneal edge is to be avoided here as well as if one were operating through the abdomen. This freed peritoneal edge I now unite with a single over-and-over stitch of light catgut on a cutting needle, to the edge of the posterior vaginal wall in midline for the purpose of subsequent peritonization. With the peritoneal edge in a fixed position I shall not have to search for it later on

when ready to close the wound. The stitch is also of some aid in effecting hemostasis.

2. *Ligation of the Broad Ligaments.*—The cervix is now lowered and held in midline. I pass a ligature carrier, armed with No. 3 iodin catgut, through the left broad ligament between the vaginal wall and cervix. This is tied and the tissues are cut away close to the cervix. A second ligature placed higher takes in the uterosacral ligament. This, in turn, is cut free, and then the lower portion of the right broad ligament and the uterosacral ligament are ligated and cut away.

3. *Opening the Anterior Culdesac.*—With strong traction on the cervix and a retractor held under the bladder the peritoneum is readily exposed anteriorly. This is opened, as has been described, by picking it up with a tissue forceps and cutting through it with the scissors. The opening is made transversely, extending to the broad ligament on each side. Examination with two fingers anteriorly and posteriorly discloses that the uterus is enlarged, hard, and symmetrical. There are no adhesions, but the fingers are unable to reach fully to the fundus. The appendages are readily palpable and found to be free, the ovaries being normal in size.

Ordinarily at this time I should bring the fundus into sharp anteversion by grasping the corpus as high on its anterior wall as possible with a vulsellum forceps and making traction thereby, at the same time pushing the cervix back into the hollow of the sacrum. If the intestines or omentum come down into the field of operation a small laparotomy pack, with a clamp attached to its tape, is passed through anteriorly, the bladder being retracted behind the symphysis. The small uterus is brought out readily, and the medium-sized one with but two or three grasps of the vulsellum. The advantage of reversing the organ in this way is that its extirpation from above downward is then made possible and, with traction on its fundal end, the ureters and uterine arteries are separated, exactly as in operation by the abdominal route. In this particular case, however, the uterus is too large to be brought out into anteversion. Likewise, as it is pulled down from below its bulk is seen to entirely occlude the wound in the vaginal vault. Accordingly, I shall expedite further work by bisecting the organ mesially, a method which simplifies very much the removal of an organ the size of this one, but before doing this un-

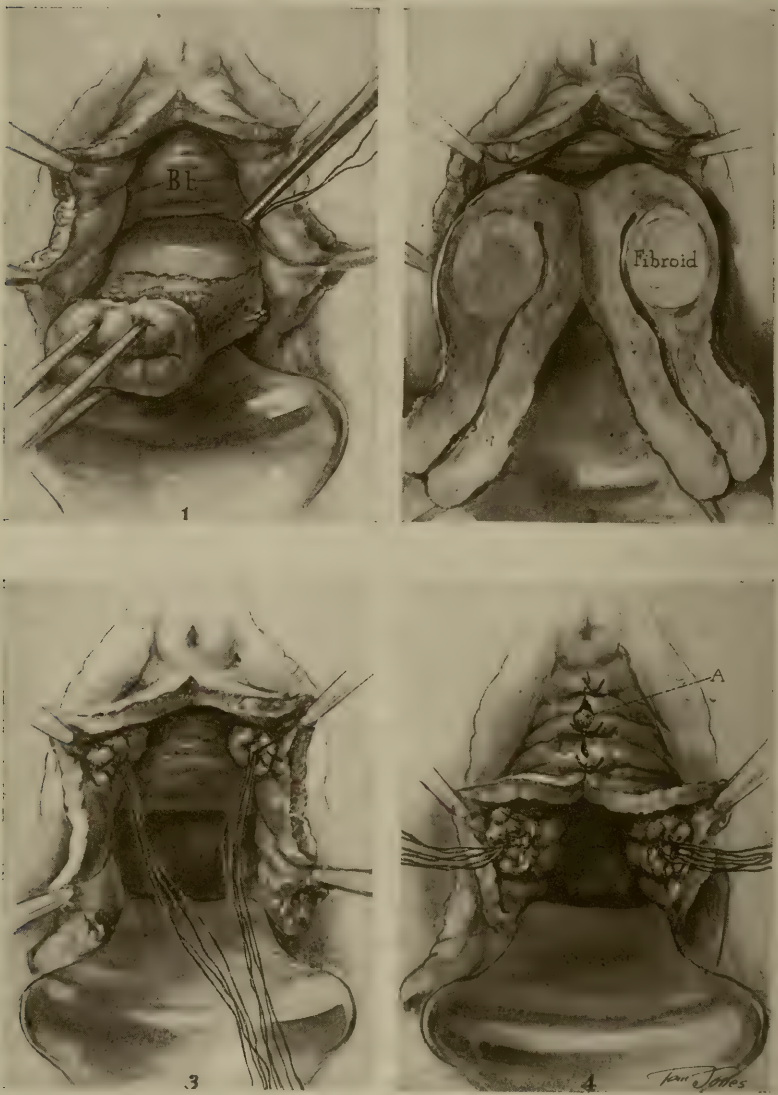

Fig. 491.

necessary hemorrhage will be avoided by ligating the uterine arteries.

4. *Ligation of the Uterine Arteries.*—This is done by passing another ligature on either side, as closely as possible to the uterus, and cutting the tissues, if necessary, even into the muscularis. In this way the ureters are safely avoided.

5. *Bisection of the Uterus.*—I now separate the two vulsella holding the cervix, and with a pair of heavy scissors cut through the anterior uterine wall from the external os upward and in the median line. The posterior wall is then split in the same way, and this incision is extended, alternately anterior and posterior, until the entire cavity is exposed. As soon as this is laid bare, but before the fundal wall is severed through its crest, that is, before the open peritoneal cavity is exposed, the mucous surfaces are carefully swabbed, first with tincture of iodin and then with alcohol. This case demonstrates very well indeed how readily an enlarged uterus, such as this, can be brought down into complete exposure by the simple expedient of splitting it. It is also observed that there is no hemorrhage, the two cut surfaces oozing but slightly.

Further reduction in the size of the uterus is now possible. It has been noticed that the bisection of the anterior wall cut through an interstitial fibroid growth, about 6 cm. in diameter,

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Fig. 491.—1, The anterior vaginal wall has been opened up and the prolapsed bladder dissected from it and from the cervix uteri. The uterus has been drawn down and isolated and the peritoneal cavity opened both anteriorly and posteriorly. On the left side a ligature-carrier is being placed on the upper portion of the broad ligament directly beneath the round ligament and appendages. 2, The uterus has been split mesially, exposing the cavity and the fibroid growth in the anterior wall. To further decrease the size of the uterus the fibroid is shelled out, enabling each half of the uterus to be pulled down more readily after the exposure and ligation of the appendages. 3, The uterus and tubes have been removed. The round ligaments have been ligated separately and are stitched each to its respective vaginal wall as far down as they can be drawn. 4, The upper portion of the anterior vaginal wall has been closed with the round ligaments (*A*) united beneath the bladder. The broad and uterosacral ligaments are stitched to the vaginal wall in the vault, so that at the completion of the closure the vaginal vault is held up in the pelvis.

situated a short distance below the fundus. The two halves of this tumor are now easily shelled out of their capsule, thus permitting the walls to collapse to a considerable extent. It is remarkable how accessible to exposure for extirpation a uterus becomes by being first freed of its fibroid growths.

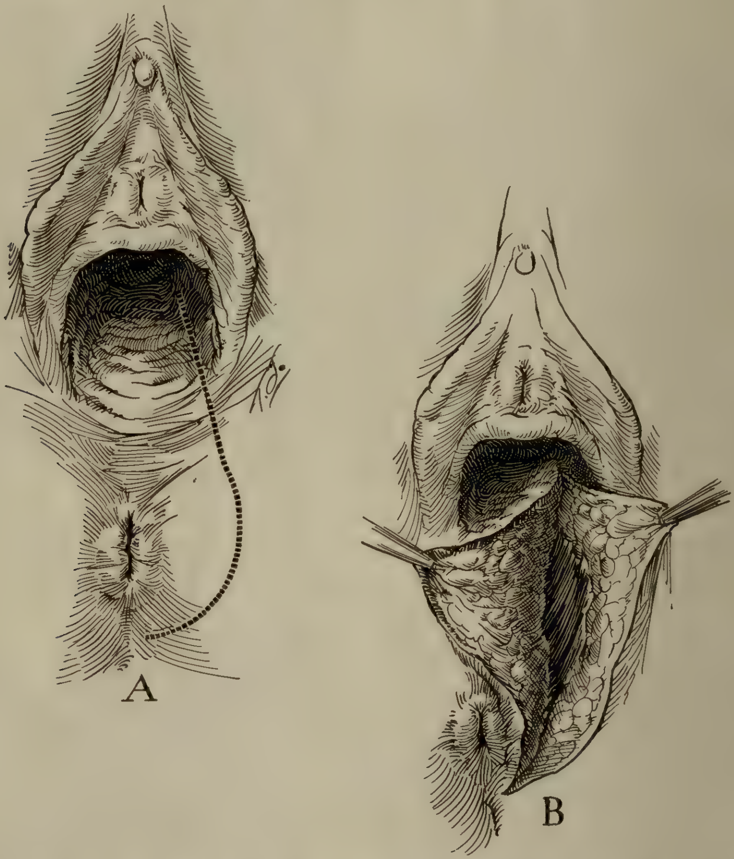

Fig. 492.—*A*, The line upon which the paravaginal section is made. *B*, The vagina has been divided along the line shown in *A*, thus enabling the rectum and the entire pelvic floor to be reflected toward the right.

As soon as the bisection is completed through the fundus, the two halves of the uterus are held apart while a small gauze pack is introduced into the pelvic cavity for the purpose of preventing any protrusion of the omentum or intestine. The long tape attached to this pack leads out over the symphysis and to it a forceps is clamped.

6. *Ligation of the Round Ligaments and Extirpation of the Tubes.*—The right half of the uterus is allowed to hang subject to the traction of its attached instruments while the left half is removed. A vulsellum fixed in the fundus of the left half serves to pull it forward, and its attached tube rolls out into view. Though not followed in every case, it is my custom to remove the tubes with the uterus in performing hysterectomy. A small hemostatic forceps attached to the fimbriated end of the tube serves by its weight to expose the peritoneal attachment to the broad ligament and ovary. I pass a ligature through this area, between the tube and ovary, tie and then cut the tube away from its attachment throughout its length. The long ends of the ligature are cut off and a second ligature is passed about the round ligament, close to the uterus, and is made to take in, as well, the uterine end of the ovarian ligament. These ligaments are next severed from the uterus, together with the upper portion of the broad ligament, and the left half of the uterus is entirely detached. If desired, a third ligature may be placed about this upper portion of the broad ligament, but for purposes of hemostasis this is not necessary.

The right half of the uterus is removed in the same way. Both of the ovaries are normal, the right one contains a corpus luteum, and neither will be removed.

After removal of the uterus the conditions presenting are as follows:

The vaginal wall, split mesially, has been retracted widely; the base of the bladder has been mobilized and is retracted behind the symphysis. The peritoneum, anteriorly and posteriorly, forms a continuous opening into the pelvic cavity. Besides the vessels tied, ligatures have been placed about the round, broad, and uterosacral ligaments. The long ends of these ligatures have been left uncut and the stumps cut so generously that moderate traction may be made upon them. The posterior peritoneal edge has been stitched to the edge of the posterior vaginal wall; the anterior, vesical, peritoneal edge is free.

The closure of this extensive wound is planned in such a way that the round and upper broad ligaments will be united beneath the bladder, to serve as a supporting structure there, while the lower broad and uterosacral ligaments will be stitched into the vaginal vault in order to hold this up in the pelvis. In the ordinary vaginal hysterectomy, not associated with colpovesicorrhaphy, the round and broad ligaments are both stitched into the vaginal vault, but here they are to be separated in order to serve a double purpose. In marked cystocele it is often better to bring both the broad and round ligaments together beneath the bladder and to run some slight risk of the upper vagina collapsing, but here such a method will not be necessary.

Before commencing to close the wound the excess of vaginal wall is trimmed away. I leave this until the present stage of the operation because one can now best estimate the amount of tissue that is redundant. In the present case it will be sufficient to cut away about .5 cm. from each edge. This is done with the scissors, and the forceps previously attached are reapplied. The ligatures holding the left round and upper broad ligaments are now pulled down as far as possible beneath the bladder, and the ligaments are stitched to the vaginal wall. This is accomplished with one or two mattress sutures of heavy chromic catgut. Each suture is passed first through the vaginal wall from without inward, then through the ligament above its ligature, next from within outward through the ligament and vaginal wall. The suture is tied, its knot lying on the outer mucous surface and the stump of the ligament protruding beyond the edge of the vaginal wall. On the right side the ligaments are fixed similarly.

In our present case the ligaments come down within an inch or less of the urethral orifice. Where relaxation is greater they can be brought usually well beneath the urethra.

Closure of the anterior vaginal wall is now effected with a continuous suture of heavy chromic catgut, beginning at the urethral end of the wound, and as the needle passes from one side to the other I reach in with a tissue forceps and pull down the free vesical edge of the peritoneum. This is included in the stitch until all peritoneal slack is taken up. As the suture reaches the point where the stumps of the ligaments protrude, it is passed back and forth, instead of over and over, thus fixing the ligaments even more securely beneath the bladder and into the vaginal wall. When the anterior fornix has been reached the suture is tied. On the left side posteriorly the broad and uterosacral ligaments are pulled down and stitched into the vaginal vault by two mattress sutures of chromic catgut. The first suture fixes the ligaments into the lateral angle of the wound, the second brings the anterior and posterior edges together about the ligaments in such a way as to cause the stumps to protrude. On the right side the remaining ligaments are similarly sutured. Before the last stitch is tied it is necessary to remove the gauze pack. In the present case no other sutures are needed to close the vaginal vault tightly, but in some cases one or two additional sutures are required. The long ends of the ligatures are now cut off *en masse.*

The last procedure in this operation consists of the closure of the Schuchardt incision and colpoperineorrhaphy. The paravaginal incision, as a procedure taken by itself, I close ordinarily by over-and-over interrupted sutures of iodized catgut, approximating tissues from side to side and filling in from below outward. At least two stages of buried sutures are required, sometimes three, and care is taken to bring muscle to muscle and fascia to fascia. The vaginal wall is reunited by a continuous chromic catgut suture and the skin by interrupted silk. Some surgeons lay a drain from the ischiorectal fossa to the lowest angle of the wound, but I have not found drainage necessary.

When considerable relaxation exists the paravaginal incision is not, of course, necessary. But in such a case as this, complicated by a small rectocele, the closure of the Schuchardt incision may be nicely combined with perineorrhaphy. To accomplish this the upper, vaginal, portion of the wound is closed first by the buried sutures, then by the superficial ones. But this closure is not carried to the extent of uniting the separated fascia of the triangular ligament, and the suture of the vaginal wall stops 2 or 3 cm. from the labium. The opposing edges of the wound where it passes through the labium are now brought into temporary apposition with a vulsellum, and from here on the operation is that for rectocele.

Exposure.—In order to protect the field of operation from the anus a fresh perineal towel is affixed, and its edge is attached with a clip to the skin of the perineum just below the mucocutaneous junction. The tissues of the hymenal remnant on the right side is picked up with a second vulsellum, sufficiently high to form a normal introitus when held in apposition with the first (left) vulsellum. It is evident here that the instrument on the right must be placed somewhat lower than that on the left. This will not endanger the symmetry of the orifice when the wounds are closed.

Incision.—With a pair of sharp-pointed, angled scissors I snip through the tissues in midline at the mucocutaneous junction and from this point cut up to the vulsellum on each side. Changing now to blunt, straight scissors I separate the vaginal mucosa from its underlying tissues, reflecting the flap upward as it is developed. As soon as the dissection is beyond scar tissue further mobilization is carried on by blunt dissection, a gauze sponge being used to wipe away the vaginal mucosa from the fascial tissue laterally and from the rectum in midline. The protruding portion of the rectum, the rectocele, is thus readily separated and pushed back. Holding the edge of the flap by tissue forceps and with two fingers in the vagina making counterpressure there is no great danger of injuring the rectal wall. Where bands of fascia are too resistant for blunt dissection I snip through them with the scissors, cutting always close to the vaginal mucosa.

In this case but a small portion of the flap need be removed. With a third vulsellum I pick up the flap in midline 2 cm. above its free edge, or at the point corresponding to the crest of the rectocele. The tissue below this vulsellum is then trimmed away with the scissors, cutting across from the vulsellum on the left to that on the right. Obviously this unites the lower portion of the Schuchardt incision on the left with the perineorrhaphy wound, and permits the exposure of a transversely oval area, the relaxation present representing a moderate diastasis of the levator muscles. With my finger I now free the underlying rectum from the fascial sheath for a short distance on the right side. On the left side the sheath is open and the levator is already accessible. The right sheath, or triangular ligament, is split longitudinally by passing through it the point of the scissors which are then opened and withdrawn, thus exposing the levator on the right side.

Suture.—With iodized catgut of proved tensile strength, threaded upon a curved cutting needle, I now unite the muscle edges of the two levators in midline by over-and-over interrupted sutures. The first stitch is placed as high as possible and its first loop picks up the under surface of the vaginal wall, thus preventing the formation of a dead space above and securing approximation of the vaginal floor to the underlying fascia and muscle. As these stitches are tied I push the rectum back and upward with the index-finger. It is not necessary in this first row of sutures to pass the needle deeply, thus rolling out from beneath the fascia thick muscular layers for approximation. It is sufficient to bring the edges together with little or no tension, and no effort need be made to separate the transverse perineal muscle from the levator, as is described by some authors.

The second stage of suture unites the fascial sheaths, their two edges already exposed being brought together also without tension. Again my uppermost stitch includes the vaginal wall and the last one passes through the subcutaneous tissues of the perineum. Above this tier of sutures two other stitches are usually needed to bring together the more superficial lateral structures. When these upper stitches are tied the two lateral vulsella are closely approximared. We now see the perineum virtually reconstructed. All that remains is to unite the vaginal mucous membrane within and the skin edges of the two wounds without.

Closure.—The midvulsellum is now pulled down between the two lateral ones and, as a result, two short sulci in the mucous surface are left open, one on either side, that on the left being the deeper. These I close with continuous chromic catgut sutures, and the three vulsella are removed. The cutaneous wound in midperineum is a short one and is closed with three interrupted sutures of silk which, after being tied, are not cut short. Their ends are left long and are tied together in a common knot. The cutaneous edges of the Schuchardt incision are approximated also by interrupted sutures, tied and knotted together in the same way. A light gauze pack is placed in the vagina to serve as a surgical dressing for two days. Outside a perineal dressing is applied.

As regards the method of perineorrhaphy here employed the debatable point technically hinges on the question as to whether the levators should or should not be isolated and sutured separately. This phase of the procedure appeals to many surgeons because it meets the anatomic requirements in the closure of hernia. Others regard it as unnecessary, and claim as good or better functional results by direct aponeurotic approximation. In my opinion, this is a difference of little importance in younger women, and I cannot agree that isolated levator suture gives unsatisfactory functional results. Without question it forms a superior hernia operation, and, if properly performed, does not construct a perineum too massive or rigid. Dystocia should not follow this method more readily than it follows any other that is successful. In case of obstruction at the outlet during labor, episiotomy is as justifiable after perineorrhaphy as in the primipara. In young women, such as our patient of this morning, where pregnancy is not to follow there should be no question as to the superiority of the method followed. On the other hand, in cases of procidentia of long standing and particularly in elderly women, where atrophy and loss of elasticity exist, it is best not to attempt direct approximation of the levators, but to unite fascia to fascia directly.

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THE SURGICAL CLINICS
OF
NORTH AMERICA

Volume 3 Number 5

CONTRIBUTION BY DR. ROBERT EMMETT FARR

St. Mary's Hospital, Minneapolis

SOME HELPFUL SURGICAL ADJUNCTS AND METHODS

While realizing fully that principles should not be lost sight of while one is engrossed in detail, the fact is patent that the meeting of indications in surgery is nothing more than the proper correlation in carrying out an infinite number and variety of details. Thus, such matters as the healing of wounds, the cause and control of hemorrhage, the prevention and treatment of sepsis, drainage of the bladder under certain conditions, and so forth, are the underlying principles of which this article treats.

In this message I shall detail briefly a number of adjuncts which I have used in my routine surgical work. Most of them are of minor importance and some are only modifications of the methods of others. They are presented with the hope that other surgeons may find them an aid in carrying out the routine work which confronts us all. Any appliance or method which in the slightest degree reduces the patient's discomfort or decreases his risk, or which makes the surgeon's task a whit less onerous is worth while.

Many factors have influenced the development of surgical detail. In the pre-anesthesia era it was necessary to sacrifice many essential details and violate principles on account of the necessity for speed. The development of anesthesia reduced, but did not entirely eliminate, the necessity for despatch in carrying out operative procedures. The discovery of the cause of sepsis focused the surgical mind upon its prevention when operating.

Thus, the surgeon of today is not confronted by the many difficult problems of his forefathers—many questions which quite fully occupied their minds are now solved, at least to such an extent that they are no longer the chief source of worry. He has more time at his disposal in which to improvise appliances and methods in addition to those which are now available and which are a great improvement over those of earlier days.

The following is presented, therefore, with a view to offering, for what they may be worth, a few minor aids to surgeons in applying well-established principles in doing their work.

THE APPLICATION OF RUBBER-ETHER CEMENT TO SURGERY

Sorisi and others have called attention to some of the uses to which rubber-cement may be put with advantage. A somewhat extended experience with this solution leads the writer to the conclusion that some of its many advantages should, from time to time, be brought to the attention of the profession.

Rubber-ether cement is made up in the following proportions: Use 1 part of rubber cement to from 4 to 5 parts of ether.

Uses.—Sorisi states that this solution may be used routinely for sterilizing the skin, and that when it is applied it is unnecessary to use towels or gauze to prevent the abdominal viscera from coming in contact with the former. Our experience coincides with his in this respect. Murphy used a somewhat similar solution for the skin and hands many years ago and, indeed, at one period he contended that when it was used rubber gloves were unnecessary. We have found three uses for the solution which are most gratifying.

The first and most important is its application to all skin surfaces which, after operation, are apt to be subjected to more or less constant moisture. The most important of these are cases in which fistulous openings connected with the pancreatic or gastric secretions are made. The duodenum, stomach, jejunum or gall-bladder, or drainage of the pancreas itself furnish the most disagreeable fistulæ on account of the great liability of skin "digestion" from the secretions which flow from these organs. About the face, the oral secretions may produce the same effect, though to a less degree. Suprapubic cystostomy is another offender along this line, as is any fistula connecting the skin with the urinary tract. Colostomy calls for the same application.

The second condition to which I wish especially to call attention is in cases of suppuration in which Dakin's solution is being employed. Here the use of the rubber-cement solution is so much more simple, clean, and economical that we have discarded vaselin gauze entirely.

A third important function of the cement is as an adjunct to the application of rubber adhesive plaster to the skin—especially when extension is to be applied, as suggested also by Sorisi. He showed that by using the rubber solution upon the skin before applying adhesive strips the cohesive quality of the latter is increased many fold.

Rubber cement may be purchased at small cost, dissolved in ether, and kept in a glass bottle. It may be painted upon the skin by means of a gauze pledget or an applicator. Several coats should be applied at a sitting and care should be taken to see that the surface is dry and clean before the application is made. It disappears within a few days and should be renewed whenever a further application is indicated.

THE SHOE-HOOK ADHESIVE DRESSING

I am indebted to Dr. L. L. McArthur of Chicago for the combination of the shoe-hook and adhesive plaster as a means for holding in place surgical dressings. Since my attention was called to the method by this most ingenious surgeon I have used it routinely in my practice, substituting for the tapes used by Dr. McArthur ordinary rubber bands (Figs. 493, 494).

The stamp employed for placing the hooks may be obtained at any shoemakers' supply house and at small cost.

The adhesive straps may be cut in appropriate lengths and sizes and the hooks stamped into them, after which they may be

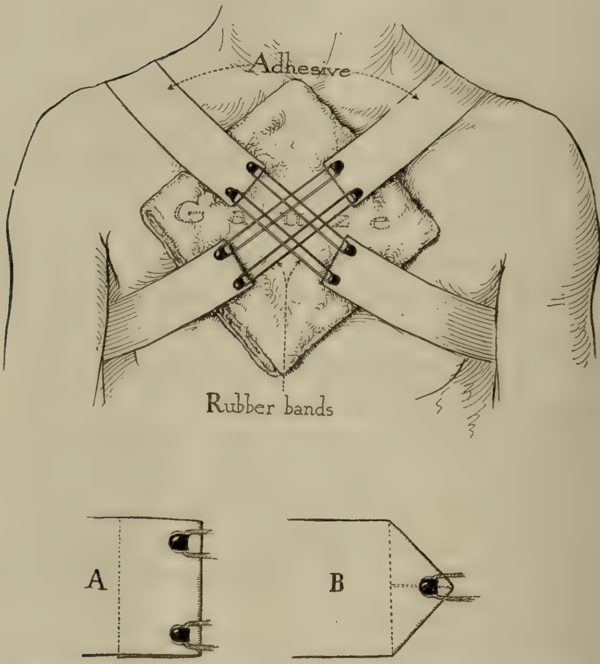

Fig. 493.—Shoe-hook adhesive dressing applied to chest. A and B, Methods of folding adhesive.

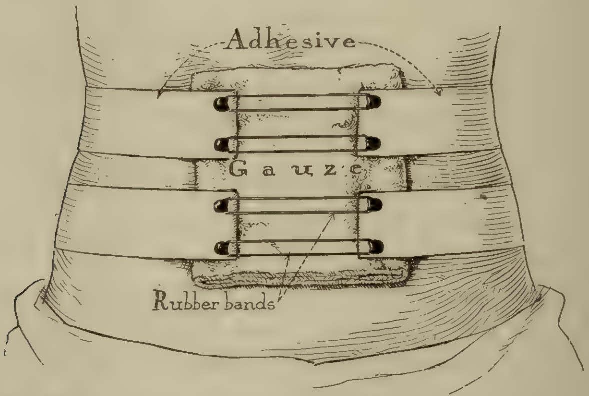

Fig. 494.—Shoe-hook adhesive dressing applied to abdomen.

kept in readiness with the dressing-room or operating-room supplies—the crinoline facing, of course, being left in place. In the hospital where a large number of the adhesive straps are used it is found advantageous to have them prepared in pairs with the adhesive sides opposing, and these may be separated as needed to apply the dressing. The ends of the adhesive strips may be folded as illustrated in Fig. 493, A and B.

The use of rubber bands insures against slipping of the dressing even in ambulatory cases, and the elastic pressure furnished, while not sufficient to be disagreeable, is oftentimes desirable; furthermore, the elastic bands are most easily obtained and have the additional attribute of cleanliness. The use of the straps is, of course, not limited to the areas shown in the figures, but is practicable on any rounded surface, as the thigh, the kidney region, the thorax and the neck, as in thyroidectomy, laryngectomy, or esophageal surgery.

THE AUTOMATIC WIRE SPRING RETRACTOR

The wire spring retractor has probably been used for ages. The principle is an old one and no claim for priority accompanies this description of the instrument, the modifications of which the writer has devised. My main reasons for referring to it in more detail than I have employed in former articles in which I have recorded some of its advantages when using local anesthesia are: first, my belief, founded upon personal experience, that its advantages are not generally appreciated; and second, the universal interest shown by all visiting surgeons upon seeing the instrument in use and their enthusiasm after using it themselves.

Its application is so universal and it may be used for such a variety of purposes—some of which will be detailed below—that further description may lead to a wider appreciation of its merits.

Varieties.—The wire spring retractor as the writer has modified it is available in a variety of sizes and shapes and each model may be applied to a great variety of incisions. The instrument is also useful in suppurating wounds, as described below. Figure 495 shows retractors Nos. 1, 2, 3, and 4. The application of 1, 2, and 3 is obvious. No. 1 is used in the smaller and more superficial incisions. No. 2 may be used in all skin incisions and is of special efficiency in separating the labii when doing operations upon the perineum or in any vaginal operation. Placed at right angles to each other in the rectum they will effectually expose the mucosa. They may be placed between the folds of the buttocks in adipose patients in order to improve the exposure. No. 3 may be used in deeper wounds, especially for separating the muscular and fascial layers. No. 4 may be used in bladder, rectum, vagina, or abdomen. Nos. 5, 6, and 7 (Fig. 496) are designated for use in abdominal work.

Nos. 5 and 6, it will be noted, present a loop upon one side and a sharp point upon the other. The point engages the muscle or aponeurosis, while the loop, which is short and curved in No. 5, engages the opposite wall, including all layers, and if placed diagonally in the midline pelvic incision it will retract downward and outward. No. 6 differs from No. 5 in that its loop is longer. Its special function is to retain the viscera in position in intraperitoneal work. In the pelvis, after displacing the intestines into the upper abdomen, two of these are placed diagonally, the sharp point engaging the muscle of the abdominal wall below and the long loop making elastic pressure in each lateral half of the abdomen. In the upper abdomen the No. 6 may be used to carry the colon, stomach, or duodenum out of the field. No. 5 will apply here also, and No. 7 has the merits of both, in that the abdominal wall is retracted by the short loop while the

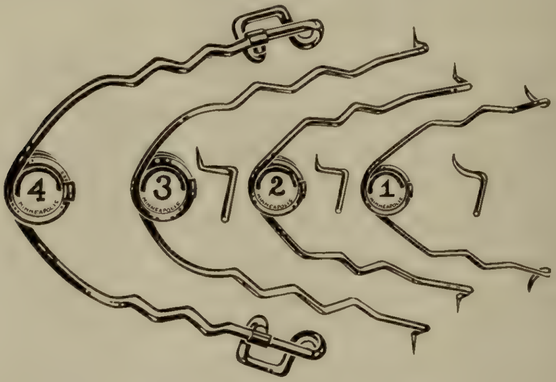

Fig. 495.—Automatic wire spring retractors Nos. 1, 2, 3, and 4.

viscera are excluded from the field by the long one. This instrument also has the advantage that the arms are longer and well out of the field.

Special Advantages.—It has seemed to the writer that these retractors more nearly meet the demands of the patient's best interests and more effectually perform the service demanded by the surgeon than does any other variety of self-retaining retractor. They make a constant elastic pressure upon the tissues and cannot traumatize them. By their use the incision is gradually enlarged without tearing the structures. Movable viscera are pressed out of the field only as far as they will easily yield.

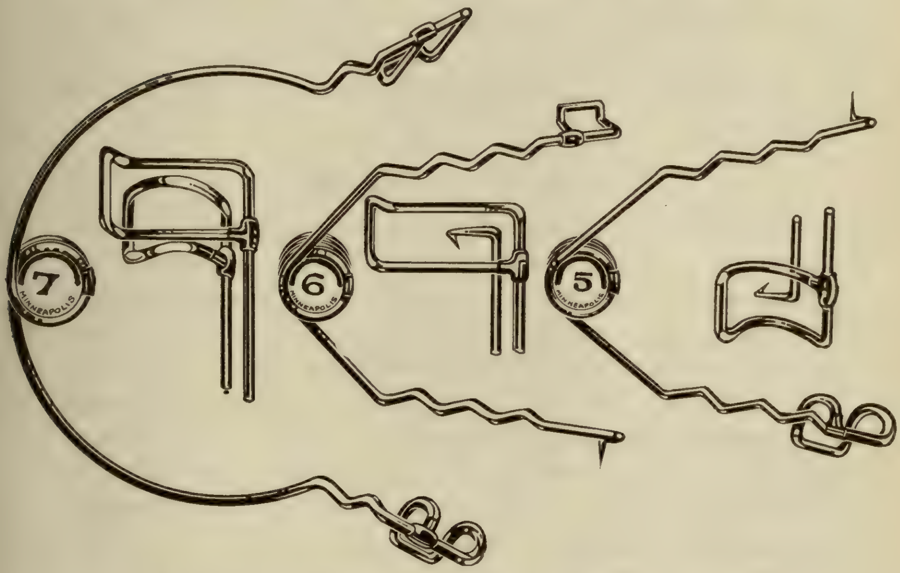

Fig. 496.—Automatic wire spring retractors Nos. 5, 6, and 7.

One of the most important points relates to the elimination of one assistant. These retractors will perform the function of retraction more effectually than any assistant can possibly do it and they are always "on the job."

Another point relates to the small amount of space required for even a large number of them. They may be superimposed upon each other or introduced so as to make the incision circular if one so desires.

It is to be noted that the arms of these retractors are "krinkled" so that they may be firmly held in the hand, and yet they present no rings or other devices upon the sides which might entangle the ligatures.

The strength or "pull" of each instrument may be regulated at will by the surgeon, as it is quite dependent upon the "spread" of the arms.

We have used them a number of times in separating the opposing surfaces of suppurating wounds. They are superior to gauze, tubes, or other drainage material for this purpose.

And finally, they are comparatively inexpensive and will last indefinitely.

A WOUND CONTRACTOR

The wound contractor (Fig. 497) has been devised for the purpose of furnishing the surgeon with a simple means of approximating the opposite skin edges in the case of a great variety of wounds. It may be applied in the case of granulating areas in order to hasten the approach of the skin edges toward each other (Fig. 497), also to incised wounds which have separated on account of suppuration or for other reasons. It may be used in order to relieve tension upon sutured wounds when indicated.

The instrument has the following attributes: It furnishes one an elastic force which is often desirable. It allows the use of adhesive traction without in any manner interfering with the wound surfaces. It is inexpensive and sterilizable.

The illustration (Fig. 497) shows the application of the contractor. The amount of traction applied may be graduated to suit the individual case. Its regulation is brought about in the following manner: First the instrument is constructed in three different sizes of wire and, therefore, is of different degrees of strength; second, the "spread" of the instrument may be varied to suit the indications—the wider the spread, the more vigorous will be the pull. If in any instance it is necessary to place the adhesive straps at a fixed distance from each other, the spread of the contractor may be increased or decreased at will by forcibly modifying the width of its blades. If a still greater pull is desired, additional contractors may be applied.

The adhesive tapes of any width should be reinforced at the end which approximates the wound by folding them over a small strip of wood. A match or a portion of an applicator or tongue depressor will answer the purpose. After placing the adhesive strips, the contractor may be applied in such a manner as to equalize the pull upon the edges of the adhesive tape. Wide areas may require the application of two or more contractors. However, the proper placing of the instrument will, through the agency of the reinforcing strips of wood, distribute the force perfectly, regardless of the number used.

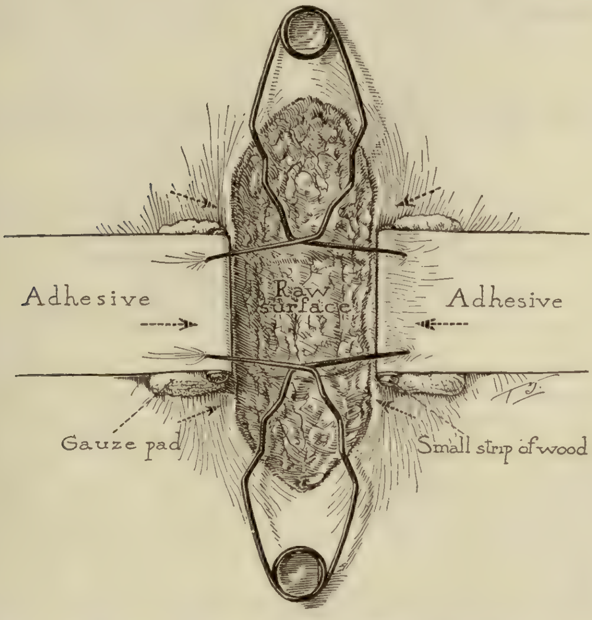

Fig. 497.—Wound contractor aiding in approximating the skin edges.

The contractor can be used with great satisfaction after hare-lip operations and amputations of the breast where it is so frequently desirable to relieve the tension upon the sutures.

COSMETICS IN OPERATION FOR UMBILICAL HERNIA

Other things being equal, the complete fulfilment of surgical indications demands the retention or restoration of tissues or structures to a relation as nearly normal as possible following any surgical operation. While operations upon the exposed portions are relatively more exacting and make greater demands, relatively speaking, it is desirable from a cosmetic standpoint to carry out operations upon any surface of the body with an eye to the cosmetic result. Women, for instance, are exceedingly thankful when the plastic resection of the breast is carried out and a benign tumor is removed without leaving a disfiguring scar. The same may be said of the results of the Pfannenstiehl incision. The mental effect of disfiguring operations, even though they occur on portions of the body that do not show, is by no means negligible and is not confined to the female sex alone—in fact, personal experience would lead me to believe that the male is more exacting than the female in this regard.

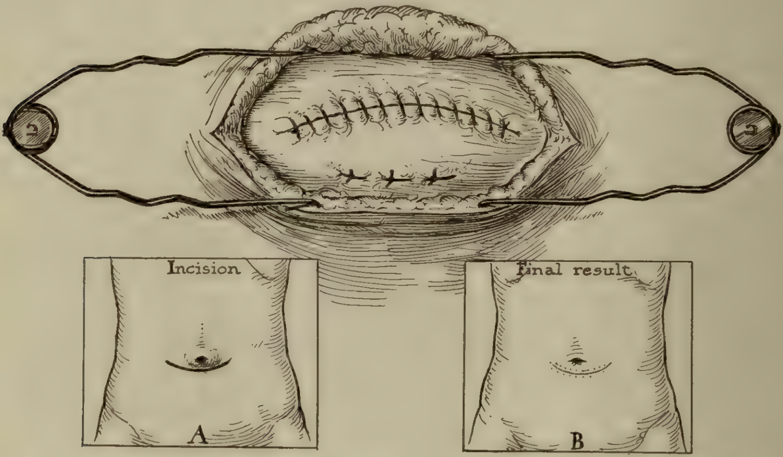

Fig. 498.—Cosmetics in operation for umbilical hernia: A, Incision. B, Final result.

We have, for a number of years, conserved the skin outline of the umbilicus in carrying out the operation for the radical cure of certain types of umbilical hernia. The operation is applicable to the less advanced types. Obviously, in cases in which the configuration of the navel has been entirely obliterated, the cosmetic operation is not indicated so clearly (Fig. 498).

The operation is carried out as follows: A slightly curved transverse incision is made below the navel and the skin-flap dissected upward (Fig. 498). The indicated operation is then carried out and the navel made to simulate its former appearance. In some instances the umbilicus will, if not excised, quite naturally take on the appearance of the normal. However, a normal appearing navel may be constructed by drawing down an inverted tent of skin and attaching it to the aponeurosis. The more simple forms of umbilical hernia may be easily repaired through a single incision, as when the umbilicus has been excised, and we have found that all classes of patients express their appreciation of the cosmetic result obtained.

THE PREOPERATIVE VAGINAL PACK AS AN ADJUNCT TO ABDOMINAL PELVIC SURGERY

The writer has made use of preliminary packing of the vaginal vault with sterile gauze as an adjunct to abdominal pelvic operations as a routine measure. Its use has been made to serve two purposes: First, the elevation of the uterus, and second, as an aid in placing vaginal pelvic drainage.

1. **Elevation of the Uterus.**—The performance of abdominal operations under local anesthesia suggested the use of the vaginal pack as a preliminary in simple cases of retroversion. It is well known that the dislodgment of the retroverted uterus and its elevation to a proper position may in some instances cause a patient more or less distress during an operation under local anesthesia. In an effort to avoid this unpleasant step in the operation a careful preliminary packing of the vaginal vault with sterile gauze with the patient in the knee-chest position was tried. The result in a majority of cases was found to be that the uterus was in a favorable position when the abdomen was opened, thus reducing the amount of intraperitoneal anesthesia necessary as well as the amount of discomfort to the patient, thereby facilitating the carrying out of the intraperitoneal procedure.

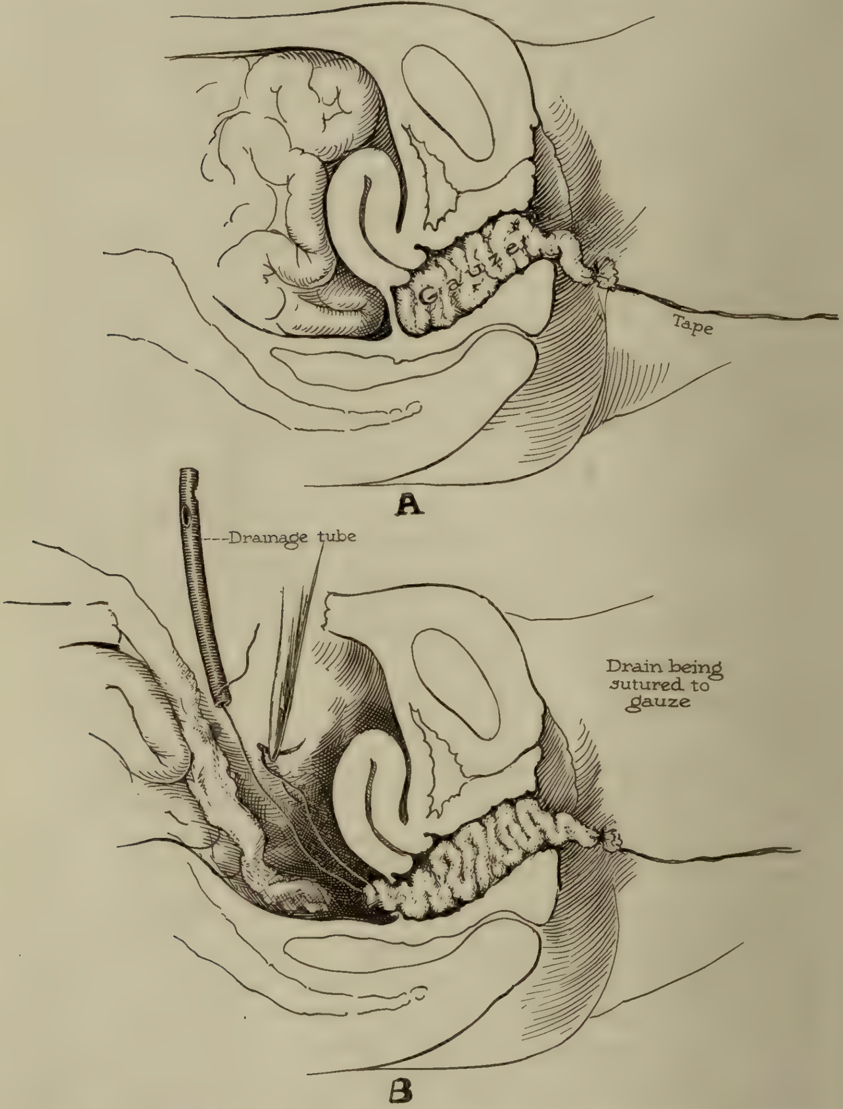

Fig. 499.—The preliminary vaginal pack: A, Gauze in vagina. B, Gauze and drainage-tube transfixed.

2. **Vaginal Drainage.**—The use of the preliminary vaginal pack for the purpose of aiding in establishing vaginal drainage

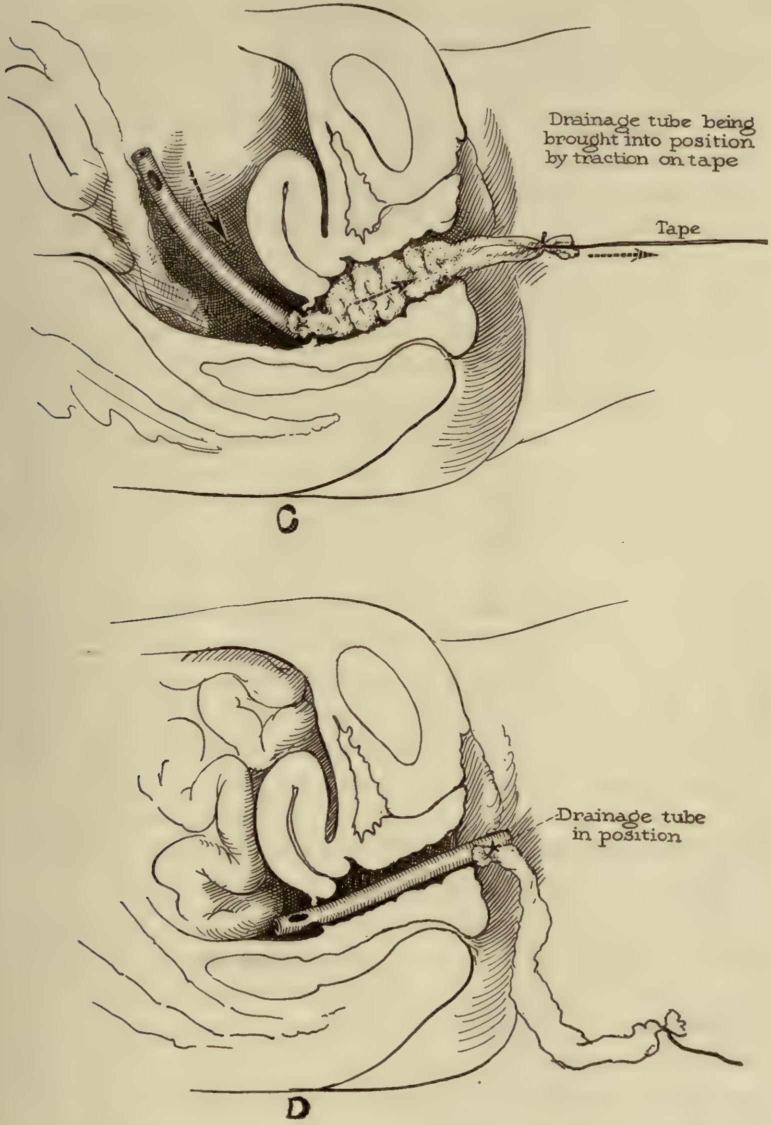
Drainage tube being brought into position by traction on tape
Tape
C
Drainage tube in position
D

Fig. 500.—The preliminary vaginal pack: C, Tape and gauze draw tube downward. D, Drainage-tube in position.

at the completion of an intraperitoneal operation upon the pelvic organs is helpful, especially when operating under local anesthesis.

The method, however, presents advantages of almost equal importance when general anesthesia is used. In case the establishment of vaginal drainage may be anticipated the vagina should be thoroughly cleansed and the posterior vault snugly packed with sterile gauze (Fig. 499, A). The preliminary vaginal pack should be firmly attached to a strong piece of cord or tape of sufficient length to reach a point well beyond the patient's feet. Thus an attendant in the operating-room may, without interfering with the aseptic technic, withdraw the gauze from the vagina by making traction upon the tape. At the completion of the abdominal operation or when the appropriate time for the introduction of the vaginal drain has arrived, the gauze, which will present through the vaginal pelvic incision, may be transfixed by a needle carrying a strong ligature (Fig. 499, B) which has been carried through the distal or vaginal end of the proposed drain. After securely tying the ligature, thus uniting the drain to the vaginal gauze (Fig. 500, C), the latter is slowly withdrawn from the vagina by means of the tape, thus carrying the vaginal drain into place (Fig. 500, D). This method has the advantage over the time-honored plan of having the assistant discommode the sterile drapes while he blindly introduces an instrument into the vagina during the operation for the purpose of grasping the drain and drawing it into place.

A SIMPLE METHOD OF ANCHORING THE IN-LYING CATHETER IN THE MALE

The illustration (Fig. 501, A) will show the application of the method. Silkworm-gut is the most appropriate material to use. The catheter may be lightly transfixed by the ligature or the latter may be tied snugly around the catheter at the proper point. The ligature is then brought closely around the penis just proximal to the corona glandis. This method is simple, is non-irritating to the patient, does not interfere with the proper cleansing of the parts, and allows but slight variation in the position of the catheter. In case priapism is to be anticipated, one may use a close-fitting rubber band to encircle the penis (Fig. 501, B).

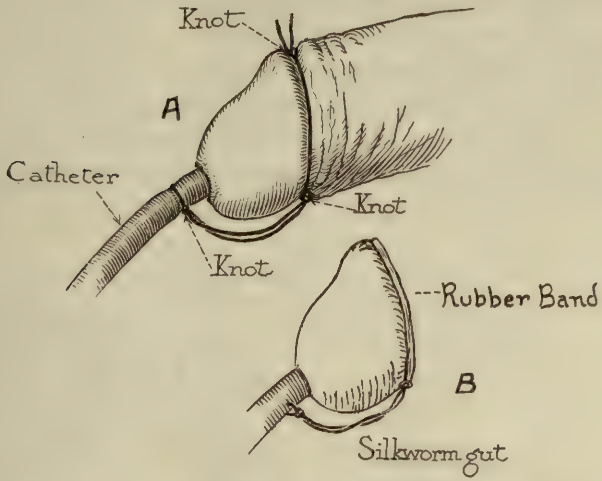

Fig. 501.—Simple method of anchoring the in-lying catheter: A, Silkworm-gut. B, Rubber band.

AIR DILATATION OF THE BLADDER IN SUPRAPUBIC CYSTOSTOMY

It is the custom, I believe, with most surgeons to use fluid distention of the bladder as a preliminary to making a suprapubic incision into this organ. The viscus is more easily identified when distended. This method has a disagreeable sequel, the "spill," which comes when the bladder is finally opened, unless one uses the utmost care by means of suction or sponging in an effort to prevent it. When employing local anesthesia the conscious patient may be much disturbed and made very uncomfortable by this inadvertance.

We have for many years employed air dilatation of the bladder as a preliminary adjunct to opening this organ. Obviously the method cannot be used in case the urethral catheter cannot be inserted. The technic is most simple and is as follows: After passing the catheter the bladder is thoroughly irrigated and then completely emptied. A sterile towel is placed across the thighs beneath the penis. The catheter is anchored to this towel by means of a towel clip. An extension tube is then attached to the catheter and carried down between the patient's legs to the foot of the table, at which point a pressure bulb is connected and allowed to hang sufficiently low so that the drapes may not subsequently interfere with a view of it (Fig. 502).

(If a suprapubic cystostomy only is to be made, the draping may be carried out in the usual fashion and the operation may proceed. If, however, suprapubic prostatectomy is to be done at the same time, the special method of draping described above is to be recommended (Fig. 502, Insert).

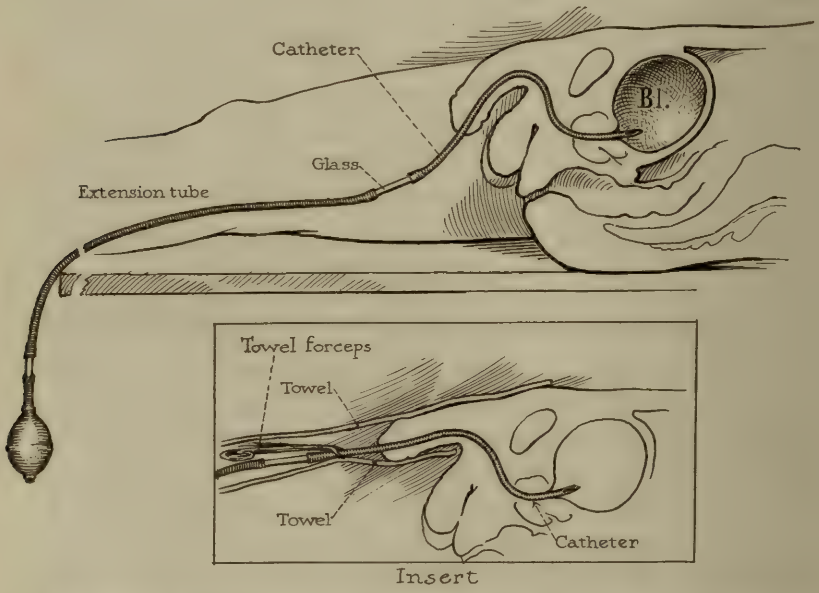

Fig. 502.—Air dilatation of the bladder: Catheter, extension tube, and bulb. Insert: Method of draping.

After separation of the recti and pyramidalis muscles an attendant may dilate the bladder with air to any desired degree by means of the pressure bulb, thus visualizing the bladder fundus, and upon opening the bladder the air will escape and the "spill" will be avoided. Incidently, provided suction is not available, the bladder mucosa will not be subjected to the traumatizing influence incident to the evacuation of this viscus by means of constant sponging.

POSTOPERATIVE HEMORRHAGE FOLLOWING SUPRAPUBIC PROSTATECTOMY

It has been the writer's misfortune to have had 3 cases of postoperative hemorrhage following the performance of suprapubic prostatectomy. As his experience has not been extensive in the performance of this operation, being perhaps about equal to that of the average general surgeon, the number of postoperative hemorrhages here recorded brings the percentage too high for comfort, to say the least, and while 2 of these patients recovered, 1 died several days later from a septic pulmonary infarct, the etiology of which was probably directly associated with the hemorrhage in the relation of cause and effect. Even in the cases that recovered blood transfusions were required, and the secondary manipulations demanded by the emergency were most disconcerting to the surgeon, as well as a source of great discomfort and anguish to the patient.

In each of these cases the prostatic bed had been packed with two, three, or four tapes of gauze, the ends of which had been allowed to extend through the suprapubic opening. The length of time after operation before the packs were removed differed in each case. The first hemorrhage occurred following the removal of packs forty-eight hours after the operation. Following this accident it became our custom to allow the packs to remain seventy-two hours. Our second hemorrhage resulted from their removal at the end of the third day, and this man, who was comparatively young and in splendid condition, died one week later as the result of a septic pneumonia of embolic origin, the autopsy showing the prostatic veins to be the seat of septic thrombosis. Following this it became our practice to allow the packs to remain ninety-six hours, and yet following this technic we experienced still another of these accidents. In each instance the following procedure was carried out in controlling the hemorrhage.

Method of Controlling Secondary Hemorrhage.—The suprapubic incision is partially opened and a long malleable sound is passed per urethrum and its point brought out through the suprapubic incision. In some instances it may be necessary to introduce a finger into the bladder in order to guide the tip of the sound to the surface. A strong fish cord is attached to the tip of the sound, which is then withdrawn from the urethra. The suprapubic end of the cord is then threaded upon a sharp needle and by this means it is carried to and fro through a piece of gauze tape about 2 inches in width, the needle piercing the gauze at about 2-inch intervals. After the needle has passed through the gauze ten or twelve times the cord is securely anchored to the gauze at the suprapubic end. While traction is being made upon the urethral end of the string, the end of the tape which was first traversed by the needle is gently guided through the suprapubic incision into the bladder. In this manner compression may be made upon the bleeding vessels. Following this, we have anchored to the end of the urethral string a fine elastic band which, in turn, is attached to the foot of the bed for the purpose of making continuous elastic pressure upon the pack. In each instance the method has proved both simple and effective.

While appreciating the fact that the rubber bag may offer a more efficient means of controlling hemorrhage, it so happened that no bag was available at the moment it was needed. The very fact that these accidents occur at comparatively long intervals makes it likely that such an apparatus as the rubber bag will be found to have deteriorated should there have been one on hand.

The simplicity with which packs of this variety—the plaited gauze pack—can be removed by the gradual method has led the writer to suggest a modification and the development of its use. The plaited gauze pack is not new and no originality is claimed for the method. However, its simplicity, the fact that its component parts are always at hand, and its efficiency in action would seem to make its use worthy of more common application.

Like others, we have found that the presence of an unprotected cord in the urethra is undesirable. Thus, in the Urologic and Cutaneous Review, 1917, I recommended the use of the plaited gauze pack following suprapubic prostatectomy, the gauze in this case being transfixed by a stout cord and carried through a rubber tube which protected the urethra. In no case in which this method of packing was used have we had postoperative hemorrhage as a complication. We have, therefore, reverted to the use of the plaited gauze pack, substituting for the cord a rubber urethral catheter.

The Gauze Catheter Pack (Fig. 503).—The manner of applying this method is shown in the illustrations. In preparing for the operation it is well to so drape the patient that after the prostate has been removed one may have access to the external end of the urethral catheter without greatly disturbing the sterile drapes. For this reason the penis with its indwelling catheter is placed between two sterile towels (Fig. 503, A and Fig. 502). As soon as the prostate has been removed and the bleeding points ligated, the urethral catheter (*e*) is advanced into the bladder and grasped by a hemostat and brought into the suprapubic opening, a clamp having been previously placed upon its other end. Another catheter (*f*) of appropriate size is now passed to and fro through a 2-inch gauze tape. In order to facilitate this maneuver a sharp pair of artery forceps is used as a guide, perforating the tape as the latter is placed upon it (Fig. 503, B). By this means the catheter (*f*) may be quickly drawn through the perforations made by the forceps. The round or bladder end of catheter (*f*) should now be transfixed by a sharp needle and silk and the gauze tape securely anchored to it at a point 1 inch from its end (Fig. 503, B and C). The other, or external end, of catheter (*f*) is now sutured to the bladder end of catheter (*e*). It will be readily seen that the withdrawal of catheter (*e*) will bring catheter (*f*) into the urethra, and as traction is made upon it (Fig. 503, C) the plaited gauze will be forced snugly into the prostatic bed. From the inner end of this folded gauze the eye of the catheter will present. It is thus in most excellent position to afford drainage of the bladder and tension upon the outer end cannot fail to control hemorrhage (Fig. 503, D).

Removal of the Pack.—For the purpose of removing the pack traction may be made upon the suture, which has been

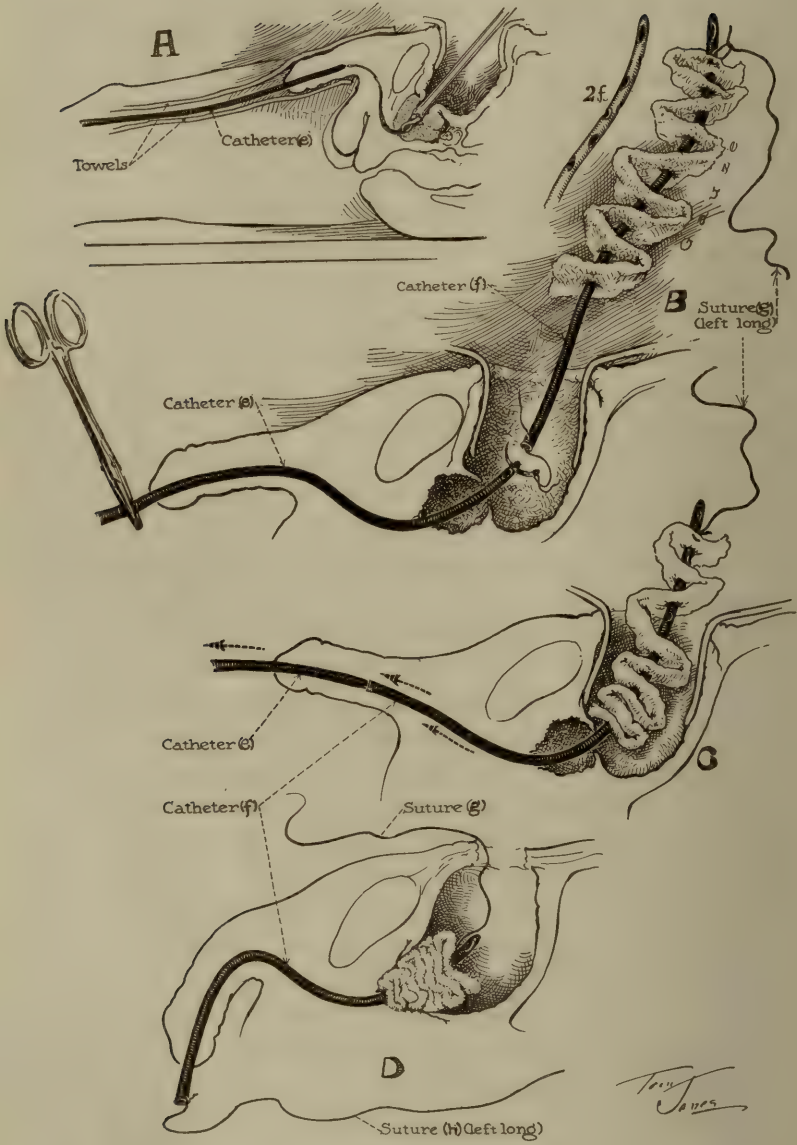

Fig. 503.—Plaited gauze-catheter method of packing after suprapubic prostatectomy: A, Method of draping. B, Plaited gauze-catheter pack. Note extra openings in catheter (*2f*). C, Pack being inserted as catheter (*e*) is withdrawn. D, Pack in place. Note sutures, *g* and *h*.

left long and allowed to extend through the suprapubic opening (Fig. 503, *g*). Before attempting its removal a string may be anchored to the external or penile end of the catheter (Fig. 503, *h*). One may now, by making traction upon the suprapubic string, gradually withdraw the prostatic pack. A number of days may be utilized in carrying out this maneuver if desired, and one may have the satisfaction of knowing that he is in absolute control of the situation at all times. The slightest evidence of hemorrhage may be met by making traction upon the penile end of the catheter or string. As a rule the gauze seems to glide more freely along the catheter than along the string, to which it sometimes becomes agglutinated, thus preventing the unfolding of the gauze plaits.

The catheter should be perforated at a number of points so that the drainage may not be interfered with when it is partially withdrawn (*2f*).

An especially desirable pack may be made by covering the gauze—an elongated diamond-shaped piece—with rubber-dam, constructing what would amount to a wide, flat Penrose drain which, when inserted, would give a spindle-shaped pack.

ASEPTIC EMPTYING OF THE DISTENDED BOWEL. "RUBBER-TOWEL METHOD"

In treating cases of acute intestinal obstruction one is often confronted with the necessity for emptying the distended bowel by means of an enterostomy. In some cases it may be impossible to sufficiently empty the bowel through one opening alone, and in certain instances the indications can only be met by opening the bowel at repeated levels in order to free this viscus from the toxic material which has accumulated within it—material which, if allowed to remain, may, and frequently does, act as a deciding factor in the progress of this extremely dangerous condition.

The opening of the bowel always carries with it the possibility of resulting peritoneal sepsis. The following method has been devised in an effort to meet the indications. It possesses the merit of simplicity, offers the surgeon the opportunity of efficiently emptying the bowel, and, in addition, safeguards the patient from the septic contamination of the peritoneal cavity to the fullest extent possible.

The only equipment necessary in addition to that which is always at hand for operations of this nature is two or three sheets of sterile rubber-dam of the approximate size of the average laparotomy towel.

The "rubber towel method" of making temporary drainage of the intestine is as follows: After isolating and carefully protecting the distended loop of gut by means of warm salt pads, a purse-string suture is introduced at a point opposite the mesenteric border. The ends of the suture, which should be of equal length, are grasped in a pair of forceps, while the midpoint of the suture is secured in the same manner (Fig. 504, A). By this means the intestine is controlled during the rest of the manipulation. The table may now be tilted and the loop of gut displaced laterally so that the area through whcih the suture has been passed is made to assume a dependent position. A rubber towel through which a short slit ahs been made is now placed between the surgeon and the protruding intestine and its lower edge allowed to hang well down over the corresponding side of the patient's abdomen (Fig. 504, B). The assistant now "feeds" the ligature through the slit in the towel to the surgeon, who, in turn, secures it by means of two pairs of forceps. In this manner the loop of gut is delivered through the slit in the towel which, in turn, is drawn snugly over the bowel for a short distance. The assistant with his hands beneath the towel may control and manipulate the bowel after the latter has been opened (Fig. 504, B). Working on the other side of the towel the surgeon may then puncture the gut between the two limbs of the suture which most effectively retains the bowel in a dependent position as its contents are allowed to escape and flow down over the towel into a basin (Fig. 504, B). A tube may be introduced and suction applied if desired. However, we have found the most effective means of emptying the bowel is to have the assistant go through the "milking" process. When the bowel is thoroughly emptied the projecting knuckle may be quite completely cleansed by means of irrigation with hot normal saline solution, after which the purse-string suture may be tied, the ends cut short, and the bowel withdrawn from the slit in the rubber towel

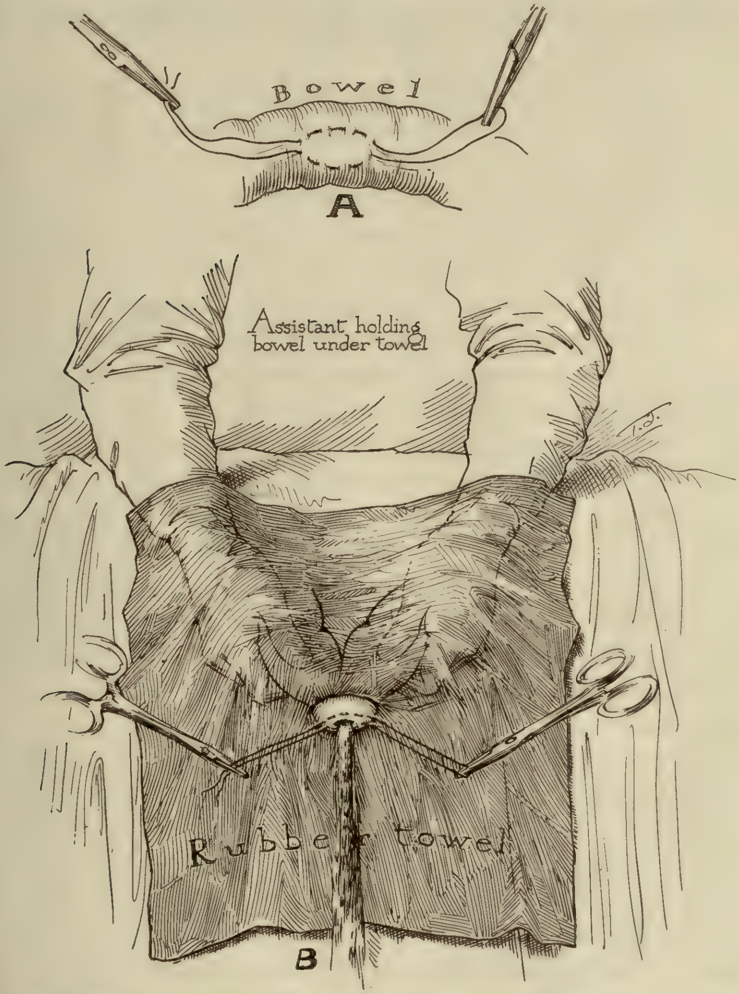

Fig. 504.—Aseptic method of emptying distended bowel, "rubber-towel method": A, Method of placing suture in bowel. B, Bowel projecting through slit in rubber towel. Bowl open. Note assistant "milking" contents of bowel through enterostomy opening.

as the latter is discarded. This process may be repeated as often as desired, thus evacuating the intestine of its toxic contents at various levels, a fresh rubber towel being used each time.

TEMPORARY SCREW FIXATION IN THE OPEN TREATMENT OF FRACTURES

Many ingenious devices and methods have been conceived for the immobolization of the fractured bone fragments after reduction by open operation has been accomplished. In the case of delayed or non-union the bone-graft inlay has no equal. The writer, however, has reference in this communication to the recent types of fracture—those in which some variety of fixation apparatus is indicated followed by closure of the wound.

Experience with the Lambotti and Parkhill methods led the writer to the conclusion that actual fixation of the internal type need not remain in place for a long period of time. Within a few days there is, as a rule, formed about the fragments a pabulum of putty-like consistency which is sufficiently cohesive to prevent the broken ends from moving at least in a lateral direction. Angulation and shortening can be controlled quite effectively in the average case by external means. As a matter of fact, once the tissues have "set" or become organized and the swelling has disappeared most fractures give little trouble to the surgeon provided a satisfactory reduction has been maintained up to that time.

Those considerations make it seem logical that some form of efficient internal fixation which could be removed comparatively early after the operation would be desirable. Success with the various methods in which the skin was pierced with pieces of metal encouraged us in the use of the plan outlined below.

The fracture having been exposed, preferably by a curved incision, and reduced, skin punctures are made at appropriate points, and the fragments, which are held firmly in the corrected position, are drilled for the introduction of the screws (Fig. 505). Each screw is introduced immediately after the withdrawal of the drill and as many are used as seems desirable. The greatest rigidity is obtained by "staggering" the screws—that is, directing them in different planes (Fig. 505, A, B, and C). The screw holes

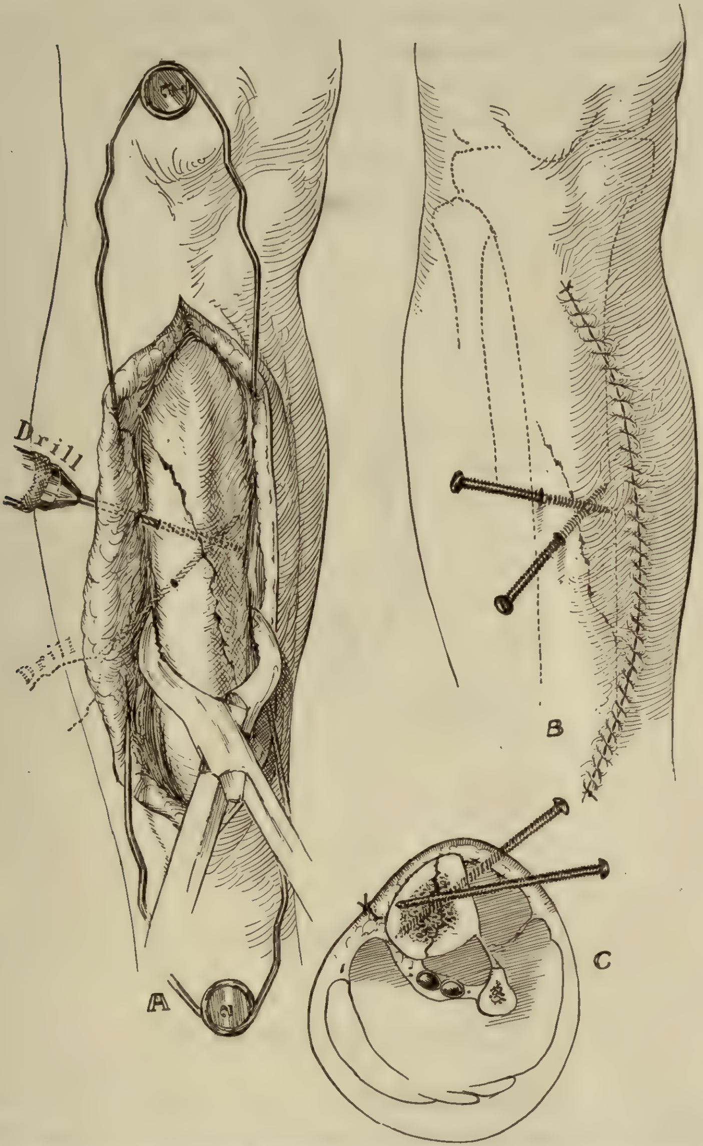

Fig. 505.—Temporary screw fixation of fractures: A, Fragments reduced and drilled. B, Screws in place, wound closed. C, Sectional view.

should be of slightly smaller diameter than the screws and the screws should be of sufficient length so that their heads will project through the skin when in position. It is most desirable that the screws be introduced through the flap or at a distance from the incision (Fig. 505, B and C).

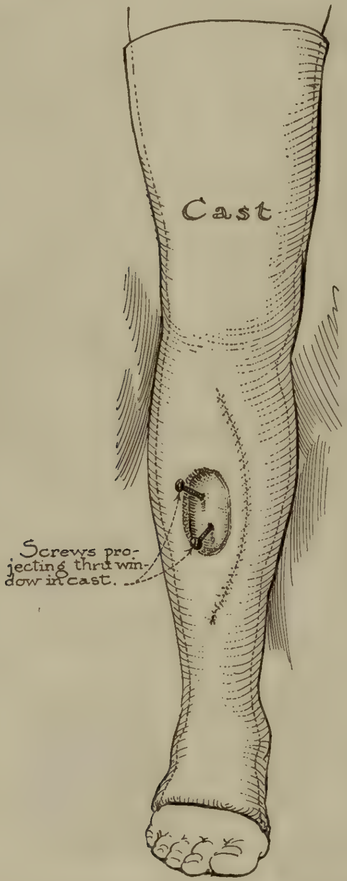

Fig. 506.—Second cast (unpadded) applied.

The most convenient method of securing screws of sufficiently small diameter and yet of the requisite length is to purchase ordinary stove bolts and have the ends sharpened so that they may easily engage in the drill hole.

After closing the wound the limb may be immobilized by any method one may choose. We have used plaster of Paris routinely. A copious dressing covers the projecting screw heads, and as a matter of routine a window remains in the cast through which they may project.

The time for the removal of the screws has not been definitely established and, indeed, it is not an easy matter to ascertain. It is perfectly obvious that the sooner foreign bodies such as these are removed, the better. We are removing them much earlier than we formerly did—one upon the eighth day, with perfect satisfaction.

Our practice is to remove the original cast after all the swelling has subsided, availing ourselves of the offices of the screw fixation the while, and apply a circular close-fitting cast in its place. In some instances the cast has been applied without any padding whatever upon the vaselined skin.

The screws are allowed to project through a fenestrum in this cast as in the original one, and may be removed when the surgeon's judgment dictates (Fig. 506). It is my belief that after the second cast is applied the screws may be removed in any case in which there is but slight tendency for the fragments to become displaced.

CLINIC OF DR. WILLIAM LERCHE

St. Luke's Hospital, St. Paul

CARCINOMA OF THE HYPOPHARYNX AND UPPER END OF THE ESOPHAGUS

Female Aged Forty-four Years. Dysphagia. Excision of Growth. Patient Living and Well Four Years After Operation.

Following a cold in 1907 the patient had difficulty in swallowing solid food for a period of five years. At the end of that period, she states, the introduction of an esophageal bougie had given her complete relief, and during the six years following deglutition was normal. In October, 1918 she had an attack of influenza, followed by dysphagia. The bougie treatment was tried without effect.

When the patient was referred to me in the latter part of March, 1919 she could not take solid food and at times cold liquids would be regurgitated, while hot liquids could be taken without difficulty. She noticed pain in her throat radiating to the region back of the right ear, and a "scratchy" feeling in the throat irrespective of swallowing. She had lost 12 pounds in weight. There were no symptoms referable to the larynx.

A general physical examination was negative. On esophagoscopic examination a growth was found on the anterior wall of the hypopharynx extending a short distance into the esophagus. A specimen of the growth was removed for examination, and the pathologic report of Dr. E. T. Bell of the University of Minnesota showed it to be carcinoma (Fig. 507). The larynx was found normal. There was no palpable enlargement of the cervical lymph-nodes. The patient was advised operation, and she came for a preliminary gastrostomy on April 29, 1919. A week later the operation for the removal of the growth was performed.

In view of the fact that the postcricoid carcinomata sometimes are superficial and do not invade the submucous tissue until late, I planned to resect the upper end of the esophagus and excise the growth in the hypopharynx. If the growth should prove to have penetrated deeply, I intended to resect the larynx, the hypopharynx, and the upper end of the esophagus. To this end a long and broad flap was cut with its base to the right of the midline, to be utilized for the plastic repair of the esophagus and hypopharynx or incidentally to cover after the resection of the laaynx, hypopharynx, and the esophagus, if such operation should be necessary.

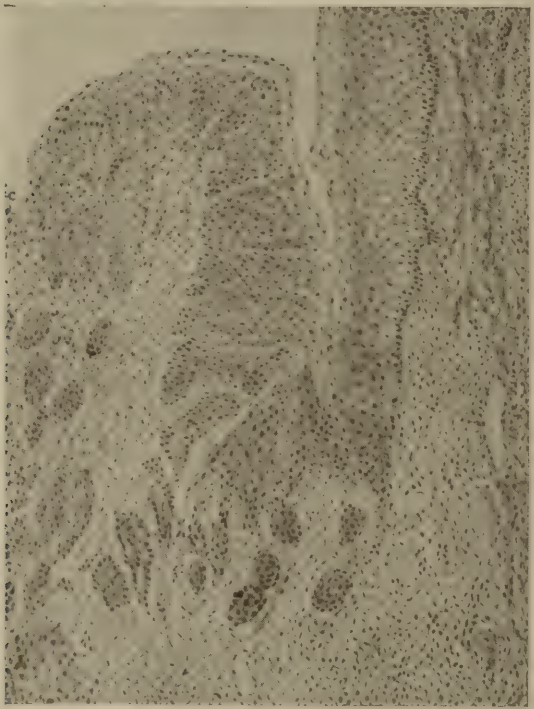

Fig. 507.—Drawing of microscopic section of the carcinoma.

After having exposed the esophagus on the left side, the growth was readily felt through the anterior esophageal wall, which was cut through well below the growth. The incision was continued upward, cutting the lower fibers of the inferior constrictor muscle. With retractors in place, a good view of the hypopharynx was obtained (Fig. 508). The incision was continued around the growth at safe distance from it, and it was found that the mucosa upon which the growth was situated could be peeled off as readily as the normal. The growth had evidently not extended beyond the mucosa neither in the hypopharynx nor in the esophagus. This discovery determined the subsequent steps in the operation. Instead of resecting the

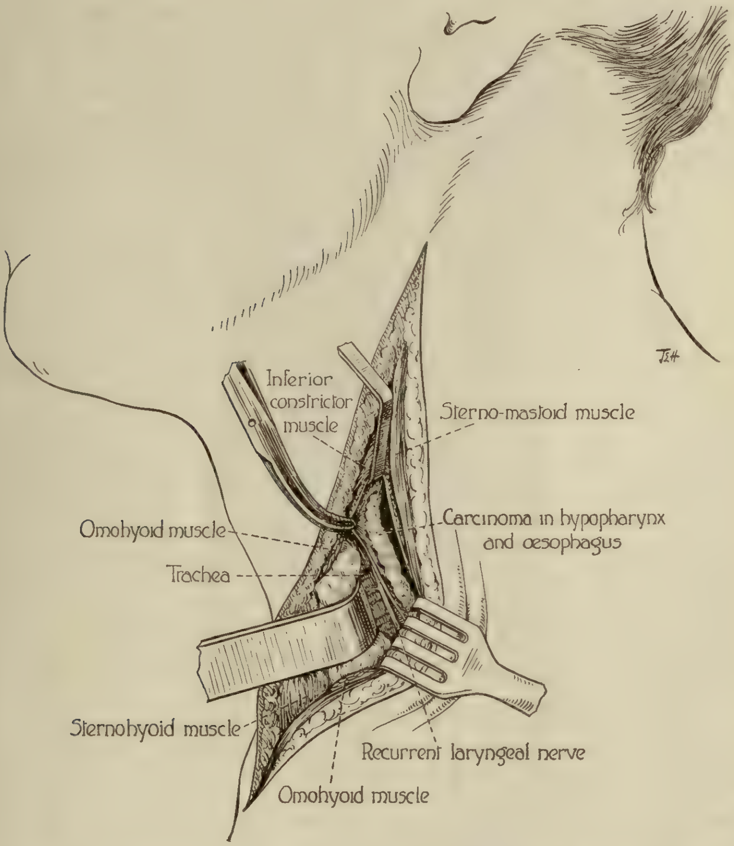
Inferior constrictor muscle
Sterno-mastoid muscle
Carcinoma in hypopharynx and oesophagus
Omohyoid muscle
Trachea
Sternohyoid muscle
Recurrent laryngeal nerve
Omohyoid muscle

Fig. 508.—Drawing of the field of the operation showing the hypopharynx and esophagus.

esophagus and bringing in the flap, a large rubber catheter (No. 32 French) was introduced far into the esophagus through the left nasal fossa. The incision in the esophagus and the hypopharynx was closed with a few interrupted sutures, leaving the large denuded area from where the growth was removed without any mucosal cover. The skin-flap was partly sewed in its original place, and the wound packed with iodoform gauze.

The patient made a good recovery. The large catheter through the nose into the esophagus was left *in situ* for two months. After its removal, esophageal bougies increasing in size to No. 42 French were introduced, at first twice a week, later at longer intervals. Esophagoscopic examination was made from time to time during the first year after the operation, and as epithelization took place; it had quite a normal appearance.

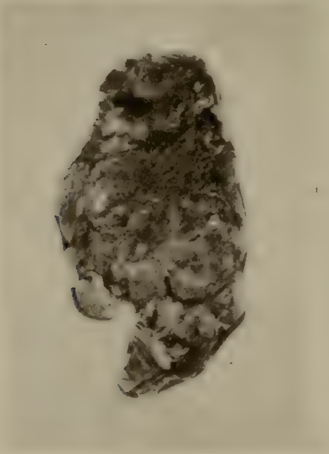

Fig. 509.—Gross specimen of the carcinoma.

The patient is in very good health four years after the operation, and has had no trouble whatever in swallowing any kind of food. She has regained her weight.

I would not make a preliminary gastrostomy in an operation of this type again, because the feeding is well taken care of by the tube left in the esophagus.

The growth (Fig. 509) was flat and of oval shape, about 4.5 cm. long, 2.5 cm. wide, and 5 mm. thick. It covered the anterior wall of the hypopharynx from a point about 7.5 mm. from the upper border of the cricoid, extending for more than 1 cm. on the anterior wall of the esophagus (Fig. 510).

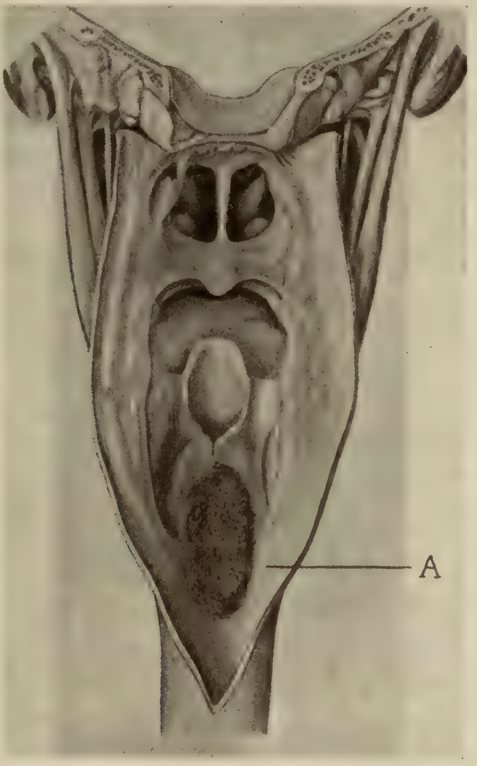

Fig. 510.—Showing the position of the growth on the anterior wall of the hypopharynx and the esophagus, A.

A number of cases of carcinoma of the hypopharynx have come under my observation, but nearly all of them in such an advanced stage as to be inoperable. Most of the cases had been treated for some time by local applications for a supposed catarrh of the pharynx. One case had received such treatment for several months one year before I saw the patient. On the other hand, a case may present itself for the first time to the physician with a far advanced growth that has given rise to comparatively little disturbance.

As mentioned above, carcinoma of the hypopharynx is sometimes of slow growth and may remain superficial for a considerable length of time. In nearly all cases dysphagia occurs early, however, and if the patient complains of even slight disturbance of deglutition, direct inspection of the hypopharynx and esophagus should be made immediately. If this was insisted upon and carried out early, I believe that we would find a larger number of these cases in the operable stage. The esophagoscope is the instrument through which definite information can be gained in these cases. The extent of the growth downward should be determined when possible, and a specimen removed for microscopic examination. The use of the *x*-rays for diagnosis in this particular locality is of very little avail and the esophageal sound should not be used.

It is of interest to note that carcinoma of the hypopharynx is so much more frequent in women than in men. Of 141 cases collected from recent literature, 122 cases occured in women and 19 in men.

The reverse is the case with carcinoma of the esophagus. Some years ago I collected several thousand cases of carcinoma of the esophagus for statistical purposes.[1] An analysis of this material of clinical and postmortem cases showed that carcinoma of the esophagus occurred four times more frequently in men than in women.

The question why carcinoma of the hypopharynx occurs so much more frequently in women than in men remains a problematic one. There is one factor, however, that may have bearing on this question and on that of the etiology. I have had a number of cases of superficial ulcers of the hypopharynx and the upper end of the esophagus in women, but have not seen them in men. I have also had several cases of membranous stricture in the hypopharynx and upper end of the esophagus exclusively in women. In some of the latter cases were seen a superficial ulceration at the stricture in the process of healing. These membranous strictures are probably brought about in the healing process of the superficial ulcers.

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[1] A Contribution to the Etiology of Cancer of the Esophagus and Stomach, Surg., Gynec., and Obstetrics, by Wm. Lerche, July, 1916.

In the history of the case under discussion in this report there is a period of five years of difficulty in swallowing solid food several years prior to the onset of the carcinoma. This dysphagia was promptly relieved by the introduction of a bougie. I do not know of a pathologic condition in the esophagus that could be corrected by one treatment with the bougie except these thin membranous strictures.

I have had several cases with such precancerous histories of dysphagia of many years' duration, and I should like to mention one because of her age:

A young woman, thirty-two years of age, had difficulty in swallowing solid food for eight years. Then without any apparent cause the swallowing improved markedly, and it remained better for four months, when it again grew worse. When she was referred to me two months later she could not swallow anything and she was fed by rectum.

Upon examination carcinoma of the hypopharynx and esophagus involving the larynx was found. My interpretation of this case is that during the eight years of dysphagia she probably had a membranous stricture, brought about by the healing of a superficial ulcer of the hypopharynx. At the site of the ulcer the carcinoma developed, probably destroying the membranous stricture and thus giving the patient temporary relief in swallowing. As her dysphagia began at the age of twenty-four years, it is likely that the original lesion producing the stricture had commenced a considerable length of time before that, probably two or more years.

I believe that these superficial ulcers, quite frequent in women, but rarely seen in men, may be an important factor in the etiology of carcinoma of the hypopharynx and may also explain the frequency with which such growths occur in females as compared with males.

LARGE CHRONIC ULCER OF THE ESOPHAGUS WITH STRICTURE AT THE SITE OF THE ULCER

Male, Aged Fifty-five Years. Dysphagia for Twenty Years. Deep-seated Pain in Chest Radiating to the Back. Stricture at the Site of the Ulcer. Dilatation of Stricture and Treatment of Ulcer Through the Esophagoscope.

C. J. R., aged fifty-five years. Scarlatina at the age of twelve years. Gonorrhea. Twenty years ago he first noticed difficulty in swallowing while eating baked beans. The beans stuck in the lower part of the gullet until they finally were regurgitated. At first such attacks occurred every two or three months, gradually increasing in frequency. During the last twelve years the dysphagia has been continuous, and he has received treatment for stricture in a number of hospitals and clinics in the East and Middle West. At no time had esophagoscopy been made. At the present time he can only take soft food and liquids. At times he cannot drink cold water. Hot liquids are readily swallowed. He frequently regurgitates both soft food and liquids and for that reason avoids eating in public places. He has been greatly troubled with deep-seated pain in the chest radiating to the back. Physical examination revealed nothing of importance. Wassermann was negative.

Upon the introduction of an esophageal sound obstruction was met with at 34 cm. from the incisor teeth.

On esophagoscopic examination the organ above the stricture was found dilated and contained a considerable quantity of thick mucus. At the junction of the middle and lower thirds the entrance to the stricture came into view, and was found lined with a thick dirty white membrane. The upper edge of this membrane was detached here and there and underneath it could be seen a raw surface (Fig. 511). After the removal of the membrane it was observed that a large ulcerated area covered with bleeding granulations encircled the entire inner wall of the esophagus for a distance of 3 to 4 cm. (Fig. 512).

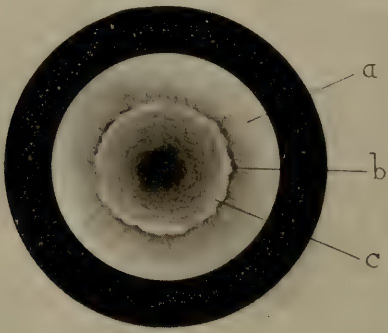

Fig. 511.—Drawing of the ulcer covered with a dirty white membrane: *a*, Normal epithelium of the esophagus; *b*, granulating ulcer; *c*, dirty white membrane of ulcer.

On fluoroscopic examination it was seen that even a thin barium mixture lingered for a considerable length of time above the constriction. The presence of quite a large dilatation was demonstrated above the stricture (Figs. 513, 514).

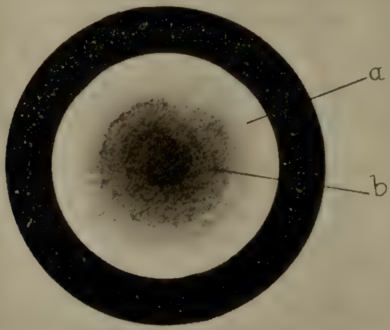

Fig. 512.—*a*, Normal epithelium of the esophagus; *b*, ulcerated area after the removal of the membrane.

The thick membrane covering the ulcer added greatly to the narrowing of the lumen of the stricture.

The etiology of this type of ulcer is somewhat obscure. In 2 cases similar to the one under consideration here that have come under my observation the onset was preceded by suppuration elsewhere in the body. In one case empyema of the antrum of Highmore preceded the affection of the esophagus, and in the other suppurative thrombophlebitis of the leg. In the latter case there was a history of having gulped up pus and blood on two occasions in the early stage of the dysphagia. It is entirely possible, therefore, that abscess in the mucosa of the esophagus with destruction of the epithelial cover may be the origin of the ulcer.

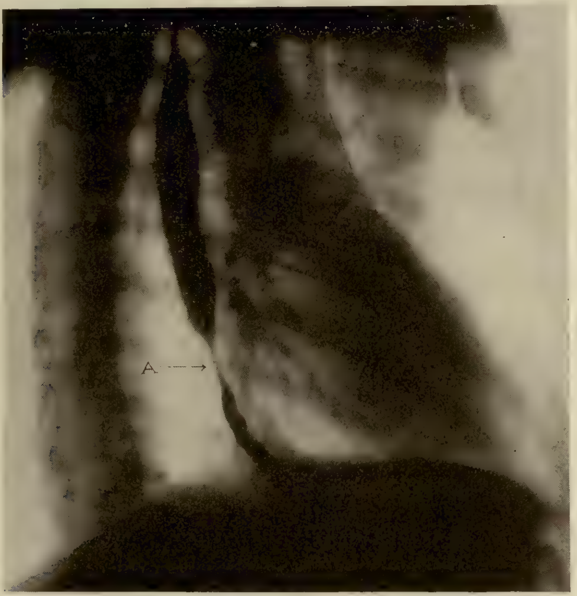

Fig. 513.—Radiographic side view of the esophagus, showing stricture at *A*.

Treatment.—The stricture was first dilated to No. 46 French in order to get a clear view of the extent of the ulceration. In the same sitting the esophagoscope was introduced, and after having removed the remnants of the membrane, the ulcer was treated by the application of nitrate of silver in 20 per cent. solution. At times I use strong tincture of iodin. The treatment is repeated once or twice a week.

In other cases like this that I have treated epithelization has taken place, and I expect equally good results in this case. The patient now can eat any kind of food without difficulty.

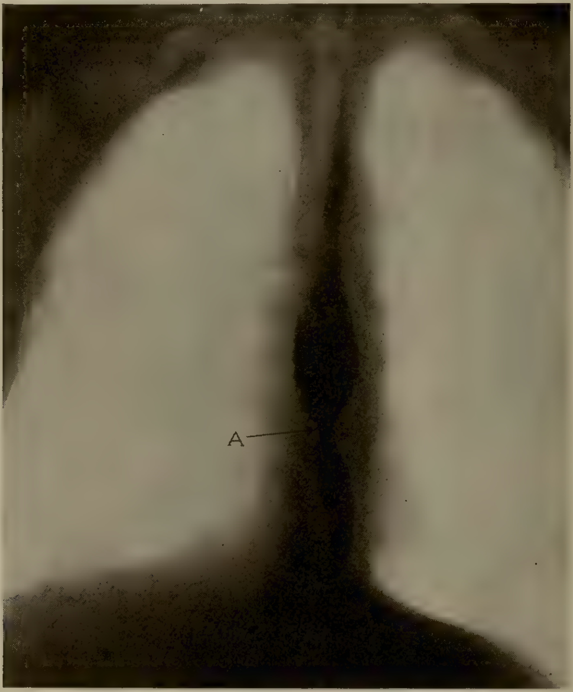

Fig. 514.—Radiographic front view of the esophagus, with thick barium mixture. Stricture at *A*.

If epithelization should not take place, the stricture would soon contract again and the patient would have to use a bougie twice a week for the rest of his life in order to be able to get his food down with any degree of comfort. If the bougie treatment is properly carried out over a long period of time after epithelization has taken place a permanent cure may be expected. However, in all cases of stricture of the esophagus, after the regular course of treatment has ceased, the organ should occasionally be examined through the esophagoscope, and a full-sized bougie introduced. By "properly carried out bougie treatment" I mean that a full-sized bougie, *i. e.*, a cylindric flexible instrument and not an olive shaped, is introduced through the stricture and left *in situ* as long as the patient can stand it, that is, ten, fifteen, or twenty minutes. In other words, a stricture of the esophagus should be treated on the same surgical principles as a stricture of the urethra.

MULTIPLE STRICTURES OF THE ESOPHAGUS AND HOURGLASS STOMACH FOLLOWING LYE POISONING

Male, Aged Fifty Years. Swallowed Lye by Accident at the Age of Forty-eight Years. Four Strictures of the Esophagus, Treated by Multiple Incisions Through the Esophagoscope, Followed by Dilatation. Well For Fourteen Years in Spite of Neglect of After-treatment; Then Recurrence of Strictures of the Esophagus and, in Addition, a Stricture of the Stomach.

H. C. G., aged fifty years, came to me in 1908 with the history that he, two years previously, by mistake, had taken a swallow of a strong solution of lye. He had had a hearty meal immediately preceding the accident and vomited promptly after drinking the lye solution. He thereupon took a wineglassful of vinegar by the order of his physician. About two weeks later the patient noticed difficulty in swallowing solid food, and he regurgitated food and thick mucus. For the two years following bougies had been introduced once or twice a week. He could not take solid food during this period and his diet consisted of eggs, milk, and soups. At times he had difficulty in swallowing liquids. A general examination of the patient was negative. Upon the introduction of an esophageal sound obstruction was met with at 27 cm. from the incisor teeth.

On esophagoscopic examination the organ above the stricture was found dilated and contained a quantity of thick mucus. The entrance of the stricture was seen to the left of the center and appeared like a funnel flattened from side to side. Besides the stricture at 27 cm. there were others found at 34, at 37, and at 41 cm. from the incisor teeth. No radiographs were taken, but I made a sketch at the time of the strictures as I saw them through the esophagoscope (Fig. 515). The strictures were tough and unyielding, but by making multiple incisions into each one, followed by dilatation, I gradually succeeded in restoring the lumen of the esophagus, so that finally bougie No. 45 French scale could be introduced without difficulty. The patient received regular biweekly treatments by bougie for some time. When discharged he could swallow any kind of food. He was instructed to have a full-sized bougie introduced once a month and later at longer intervals. I am positive that during the two years of bougie treatment the patient had

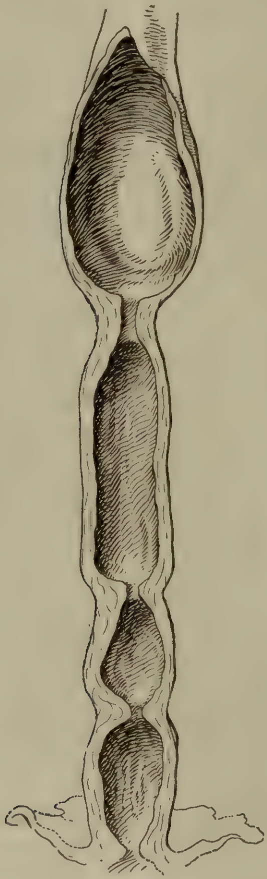

Fig. 515.—Sketch of the patient's esophagus made in 1908 from the impression gained through the esophagoscope.

following the accident the bougie at no time could have advanced beyond the first stricture, and in all probability not even through the first.

I did not see the patient again for fourteen years. He returned in Janurary, 1923, having been remarkably well until

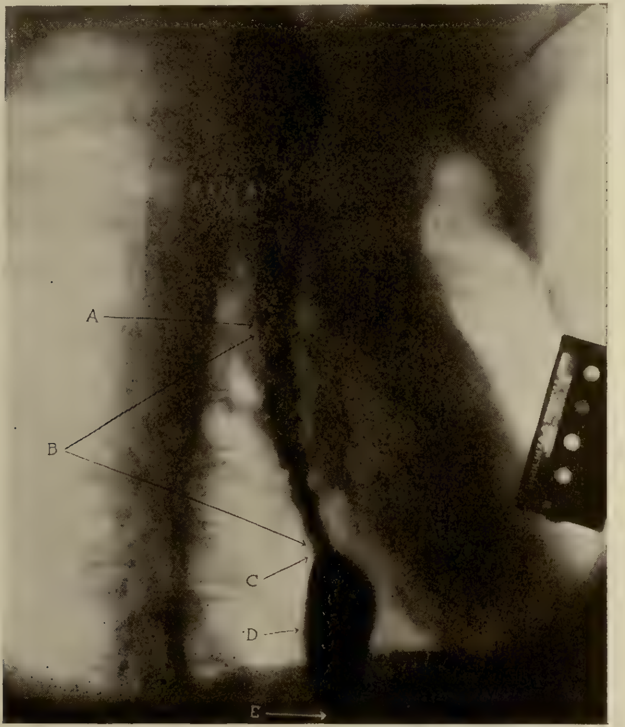

Fig. 516.—Stricture at *A*, and above this large dilatation. *B* showing the irregular, gradually narrowing esophagus. Stricture at *C*. Dilatation at *D*. Stricture near cardia at *E*.

the early part of 1922, in spite of the fact that he had absolutely neglected my instructions as to the after-treatment. Although he could eat solid food up to December, 1922, it had to be very well masticated, and liquids, if too hot or too cold, gave him great trouble. After an attack of influenza in December, 1922, he could take no solid food, it hurt to swallow liquids, and he had frequent spasms of the esophagus, epigastric pain, sour stomach, gas, and regurgitation.

Examination with the esophageal sound revealed an obstruction at 31 cm. from the incisor teeth. On esophagoscopic examination was found some narrowing of the cervical part of the esophagus, and considerable dilatation in the upper thoracic portion above the stricture at 31 cm.

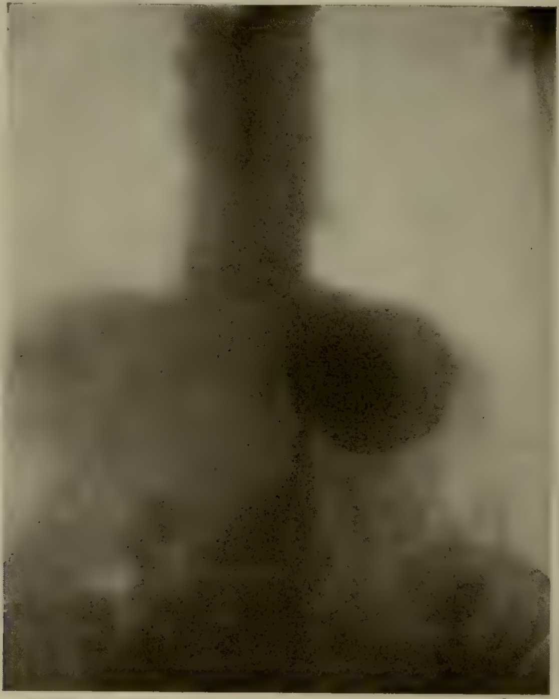

Fig. 517.—Stricture at upper and middle thirds of the stomach due to lye.

Fluoroscopy and radiographs showed dilatation in the upper thoracic part, the stricture at 31 cm., and a gradual irregular narrowing of the esophagus to about 5 cm. above the diaphragm, where the narrowest stricture was found (Fig. 516). There was also a constriction below this near the cardia. At the juncture of the upper and middle thirds of the stomach a pronounced constriction was observed, dividing the organ into two distinct compartments, the so-called hour-glass stomach (Fig. 517).

Treatment.—The strictures of the esophagus were treated by introducing bougies in increasing sizes to No. 43 French. The strictures yielded quite readily to the treatment and were not, by far, as difficult to overcome as the original ones fourteen years previous. After this treatment the patient could take solid food, but he still had considerable pain. I then passed the bougie (No. 42 French) through the stricture in the stomach twice (Fig. 518) and after the last treatment the patient reported that the pain had practically left him and he felt very much better. On March 19th I opened his abdomen with the expectation either to resect the constricted part or to make a gastro-enterostomy on the proximal pouch. An annular stricture was found which like a string encircled the stomach and through which I could push two fingers. I made an incision through the stomach wall about 6 cm. long across the stricture in the long axis of the organ, and sewed the cut surfaces together in the short axis, thereby making the passage considerably larger. This in all probability will serve him as well as a gastro-enterostomy.

Fig. 518.—Shows the flexible steel dilator in the stricture of the stomach.

The great majority of strictures caused by lye can be treated successfully by the use of bougies. There are cases, however, that do not yield to this treatment, and for this type of strictures I devised (in 1907) the method of multiple incisions. This operation is performed through the esophagoscope under the guidance of the eye. In Fig. 519 is shown the esophagotomes that I devised for this purpose.

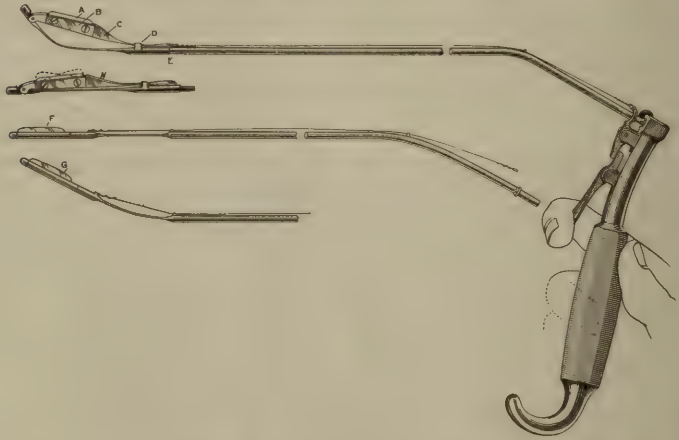

Fig. 519.—An esophagotome for adults in action: *H*, in relaxation. *F*, Esophagotome for children: *G*, in action.

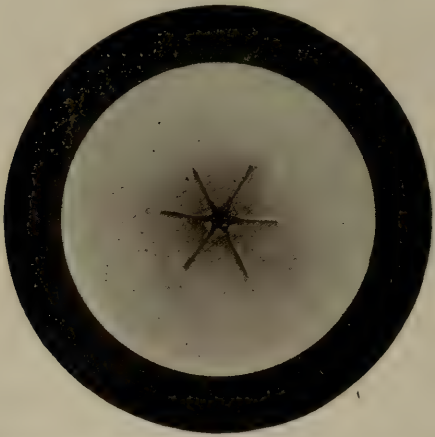

Fig. 520.—Showing multiple incisions in the stricture of the esophagus.

After the incisions are made (Fig. 520) the dilator (Fig. 521) is introduced into the stricture and the first dilation is done under the guidance of the eye. In subsequent sittings the dilatation is carried out by the use of bougies (Fig. 522). I always introduce the bougie on a guide, which consists of a long piano wire with a small olive-shaped metal tip in the distal end (Fig. 523). On this wire is threaded a long, slender and flexible steel bougie, with which it is pushed through the curved metal tube and through the esophagus into the stomach. The slender

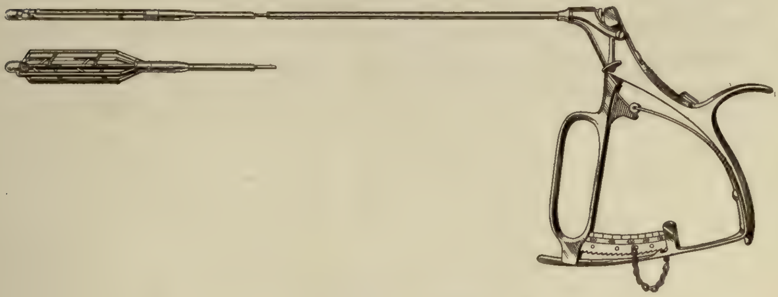

Fig. 521.—Author's esophageal dilator.

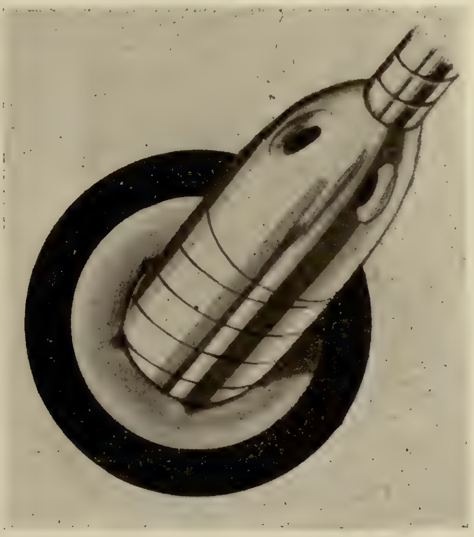

Fig. 522.—Illustrates the yielding of a resistant stricture after multiple incisions.

steel bougie is then withdrawn, leaving the guide in place, and upon the latter the larger bougie is introduced, as in Fig. 524. In most cases I succeed in passing the guide into the stomach by this method. If it fails, I try the thread method, letting the patient swallow 5 yards of stout silk thread as suggested by Mixter. I never depend upon the silk thread as a guide for the bougie, however, for the reason that if it is pulled upon fairly tight it may cut the mucosa somewhere in its course, and if it is not pulled fairly tight the bougie may do damage. On the other hand, it is a very excellent method for leading the wire guide into the stomach (Fig. 525), and for this purpose I have used it for many years. Occasionally I meet cases in which

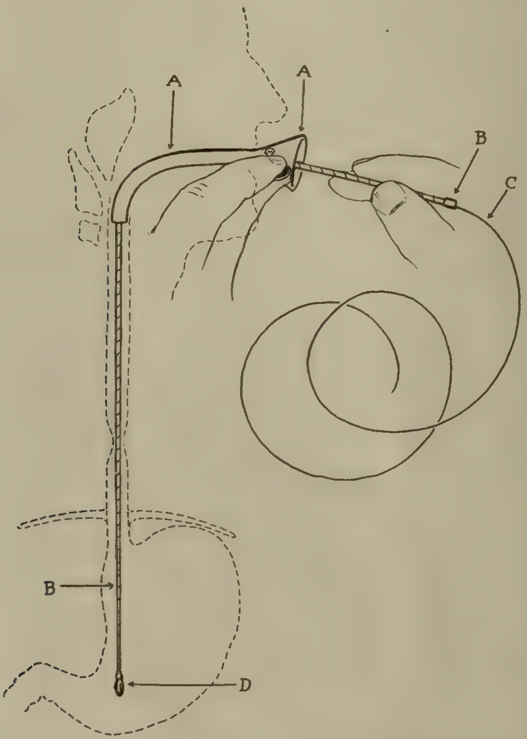

Fig. 523.—Guide (*C*, *D*) with slender steel bougie (*B*, *B*) being passed through the curved metal tube (*A*, *A*).

neither of the two procedures just mentioned will suffice. In such instances I have succeeded in introducing the guide by a special carrier (Fig. 526) through the esophagoscope.

My bougies are made of steel, flexible, and perfectly smooth. The coils cannot be pulled apart, as a brass wire on the inside holds them together, without interfering with the flexibility of the instrument. The brass wire is released when the instrument is to be cleaned or when not in use. The handle of the bougie is of brass; it is flexible and can be detached from the bougie, so as to be used as a sound when the two olive-shaped tips, which are part of the set, are screwed on. A stout stylet is used in introducing the bougie.

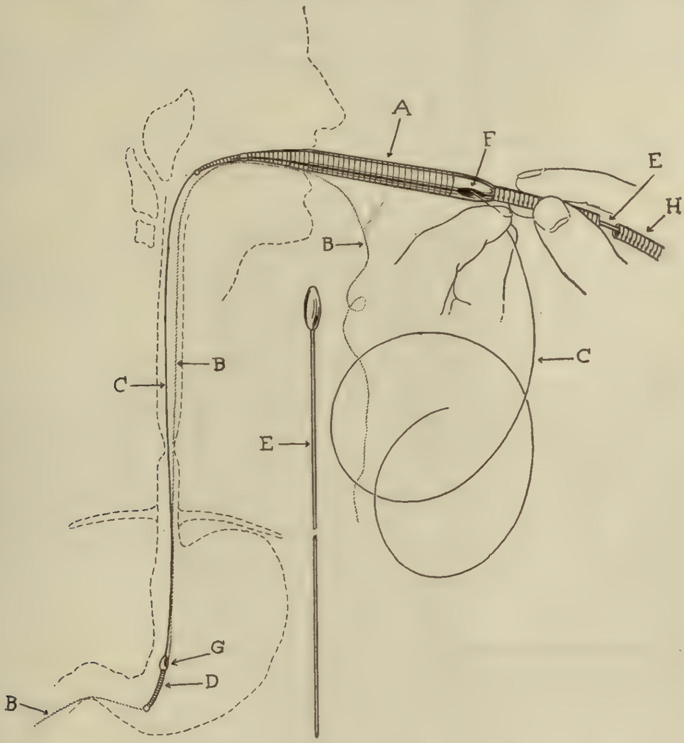

Fig. 524.—Method of introducing the bougie (*A*) on the piano wire guide (*C, C*); *E, E*, stylet; *H*, long handle on bougie.

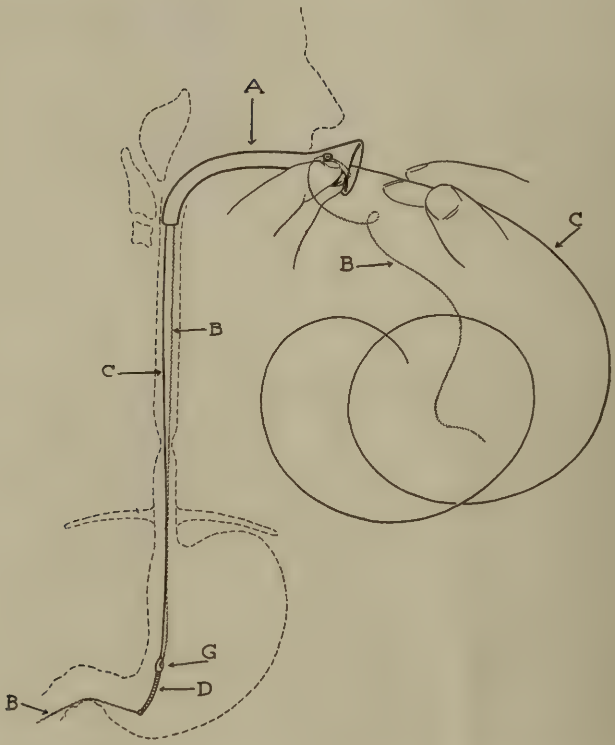

Fig. 525.—The introduction of the *C*, *C* with the very flexible tip *D* on the silk thread *B*, *B*, *B* through the curved tube *A*.

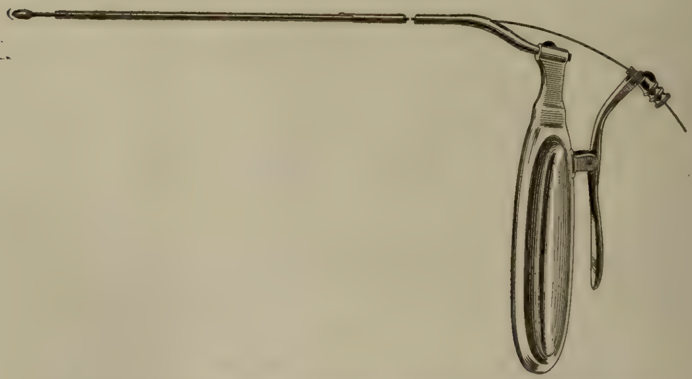

Fig. 526.—Guide carrier operated through the esophagoscope.

DIVERTICULUM OF THE ESOPHAGUS AND LARGE INTRATHORACIC GOITER

Adult Male. Dysphagia for Many Years. Removal of Intrathoracic Portion and Resection of Right and Left Lobe. Invagination of the Diverticulum. Cure.

P. S., aged sixty-three years, had noticed great enlargement of both sides of the neck, especially the right, for eighteen years, and had increasing difficulty in swallowing. If he tried to drink in the ordinary way he got a choking spell and regurgitated. Dry food troubled him very much. He could not sleep on either side, but slept quite comfortably on his back.

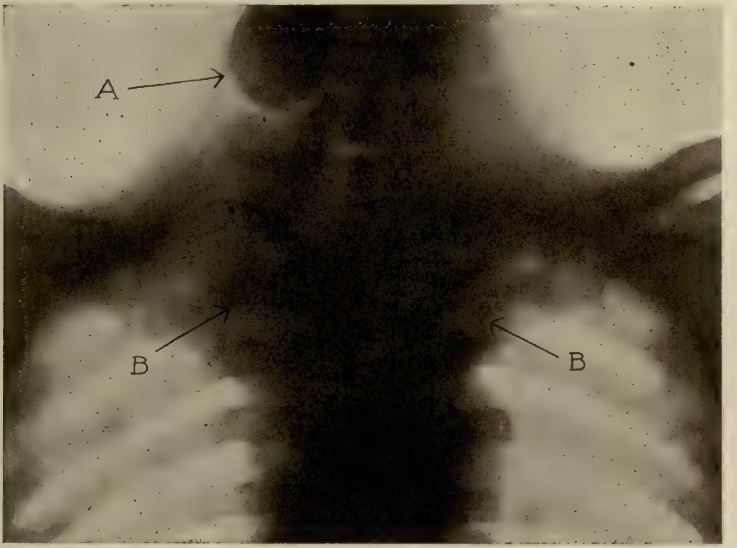

Fig. 527.—Radiograph showing a diverticulum of the esophagus (*A*) and large intrathoracic goiter (*B*, *B*).

On examination his heart action was rather rapid, there was some dilatation of the heart. The lungs were negative. Hypertension.

In esophagoscopic examination the right lobe of the thyroid was found encroaching upon the esophagus, and there was considerable resistance to the introduction of the esophagoscope.

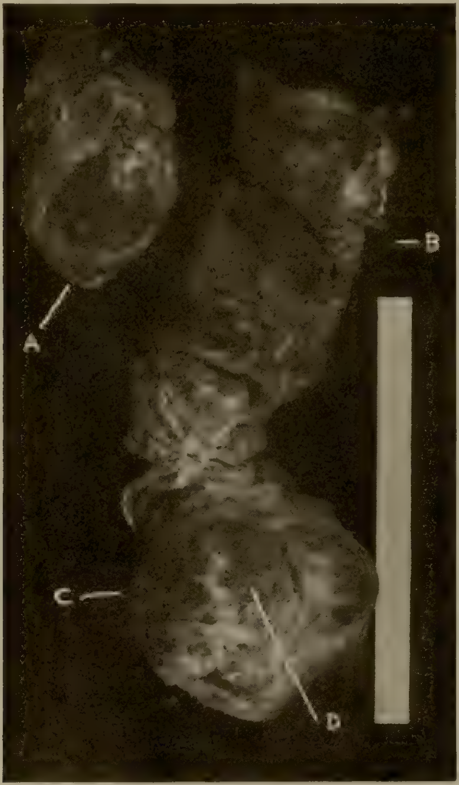

Fig. 528.—Photograph of gross specimen: *A*, Left lobe; *B*, right lobe; *C*, intrathoracic part; *D*, deep groove in the latter where it was riding on the trachea.

The obstruction was on the right side and also posteriorly to the right, so that the instrument had to be directed toward the left in order to get by. A small diverticulum was also observed.

Radiography: A large shadow was seen in the mediastinum and diagnosed an intrathoracic goiter. The esophagoscopic finding of a diverticulum was demonstrated after a barium meal (Fig. 527).

The patient had much more disturbance of deglutition than we ordinarily find with a diverticulum of this size, and the pressure of the goiter was responsible for this.

At operation, under ether, the large intrathoracic part of the goiter (Fig. 528), which was continuous with the right lobe, was removed, together with the larger part of the right lobe and a part of the left.

The pressure on the esophagus caused by the right lobe posteriorly and laterally was demonstrated at the operation.

The patient improved much after the operation, but he still had some difficulty in swallowing. At a later date the diverticulum of the esophagus was invaginated and obliterated by rows of purse-string sutures.

CLINIC OF DR. FRED L. ADAIR

Minneapolis General Hospital

CARCINOMA OF THE UTERUS

A consideration of cancer is always important not because we have such absolute knowledge regarding its etiology or cure, but because it is such a terrible disease, and its early recognition offers the only possibility of cure.

A great deal is being done by means of propaganda and education in an effort to bring in the cases earlier in the development of the disease, so that we may have a better opportunity of securing a larger percentage of relative and permanent cures. There are probably three main objectives in this educational propaganda regarding cancer:

1. Education of the public to some of the early symptoms of the disease.

2. Education of the medical profession to recognize the disease when possible sufferers present themselves.

3. Probably the most important, to increase our knowledge regarding the etiology and method of cure of the disease.

The uterus is one of the most frequent organs to be affected with cancer, and carcinoma of this organ together with that of the breast make up the vast bulk of cancer cases in women.

The educational campaign is not yielding results which are at all encouraging if one is to judge by the cases of uterine cancer which come into our hands in the Minneapolis General Hospital.

Statistics from the Minneapolis General Hospital.—In the seven years from 1916 to 1922 we have not had a large series of cases at the Minneapolis General Hospital—90 in all appearing in our series. So far as race is concerned, we had relatively few cases occurring among colored people, only 4 of our cases being among negroes. In all of these cases, however, the condition was very malignant. It was a rapidly progressing form of carcinoma. There were relatively few Jewish women in our series. The most of the patients were previously in good health, their past history usually being unimportant. The younger individuals who were attacked with the disease were somewhat undernourished and not in the best physical condition. The older women were in better physical condition and usually had attained their maximum body weight in the years just preceding the development of the cancer of the uterus.

The age incidence in our series is about forty-seven years on an average, the youngest being twenty-five years and the oldest seventy-five years. Thirteen cases occurred between twenty-five and forty, 32 between forty and fifty-five, and 20 between fifty-five and seventy-five. In 29, about 30 per cent., of the cases the symptoms began before the menopause. The younger individuals seemed to be affected with a more malignant type of the disease than were the older ones. Eleven of the cases gave a family history of cancer. This is a percentage of 12. About 88 per cent. then gave no family history of the disease. There was a higher percentage of married women than single women in our series. So far as parity is concerned, 68 per cent. of the women had borne children, and 32 per cent. had not.

There were definite statements of previous pathology of the cervix in 34 of the cases. It is quite possible that a larger number of the cases had prior cervical pathology which does not appear on the case records. In the series there was previous history of fibroids in 4, there was definite history of syphilis in 6, gonorrhea in 4, and chronic pelvic inflammatory condition in 7.

In our series of cases hemorrhage and offensive discharge were fairly constant symptoms. Seventy-one cases, or about 80 per cent., gave definite history of previous bleeding. About 62 per cent. or nearly two-thirds of the cases in this series complained of pain as a symptom. Many of our cases were already far advanced and many had previous treatment until they were in such a reduced financial condition that they sought aid at the General Hospital.

Only 31 of the cases were operated upon, 19 showed some immediate improvement, 12 showed no improvement or died shortly. The preoperative treatment, *x*-ray and radium, was done in only 2 cases. Postoperative treatment was done in 19 cases, 16 of which showed some improvement. In most of the cases operated on the procedure was purely palliative, only 2 or 3 cases being in such a condition that radical operation was possible. The duration of symptoms in these cases had been from one month to thirteen years, with an average duration of twenty-eight months. In the women from twenty-five to forty years of age the duration of symptoms averaged ten months, and in those from forty to seventy-five years of age the average duration of symptoms was nineteen months.

The above report is not a very encouraging one so far as the outlook for cure is concerned. One really has no opportunity to cure cancer of the uterus in cases which come under observation so long after the development of initial symptoms.

Apparent Increase of Carcinoma.—Considerable has been written about the increase of cancer. It is probable that this increase is more apparent than real. A number of years ago Dr. E. F. Bashford made a statement to the effect that while certain types of cancer are on the increase, "it is erroneous to make statements of a disquieting nature about the increase of cancer in general."

Recently H. G. Wells investigated a series of cases of his own which, with reports of similar series by other observers, led him to conclude that routine autopsies of cases increased the number of cancer cases from 15 to 20 per cent. It is true that prior to death certain cases are diagnosed as malignant which do not prove to be so at autopsy. On the other hand, a very much greater percentage of cases prove to be malignant which were not so diagnosed during life. It is also true that the application of more careful and satisfactory methods of diagnosis has increased the number of cancer cases. One should not, therefore, be too dogmatic in his statements regarding the actual increase of cancer.

Etiology and Prevention of Carcinoma.—When one sees a case of uterine carcinoma the etiology and prevention of the disease always come to mind. The paucity of knowledge regarding these factors in the eradication and treatment of this disease is continually emphasized in one's mind becaue methods of cure are so unsatisfactory. Etiology has been carefully studied for many years, and this work and study has not yielded the specific results which one would desire. The most interesting recent work is that of Yamagiwa and Ichikawa, who have been successful in producing the so-called tar tumors by the continued external reapplication of coal-tar. They were the first to be successful in the production of this lesion on the rabbit's ear by continued reapplication of coal-tar.

Fibiger inaugurated quite an extensive experimental study of cancer by feeding rats with cockroaches having larval nematods. These rats developed squamous-cell carcinoma of the tongue and stomach in varying percentages. Similar results have been obtained by feeding rats with Tænia crassicollis, producing carcinoma of the liver.

The occurrence of occupational cancer in tar workers, paraffin workers, chimney sweeps, *x*-ray workers, arsenic workers, all points to the rôle of persistent irritation as an etiologic factor in the causation of cancer. It is quite probable, therefore, that there may be no specific cause of cancer, that certain individuals are especially susceptible to the occurrence of irregular and uncontrolled cell proliferation, which may result from a persistent irritation at different sites and in different organs of the human body.

If chronic irritation is the cause of cancer, it is quite conceivable how certain forms of cancer should increase, while perhaps the total number of cancer cases would not be materially greater.

Changes in industry, methods of work, habits of the population, diet, etc., might easily tend to increase certain types of cancer, while perhaps other forms would tend to disappear.

How can the theory of chronic irritation be applied to the development of uterine cancer? It is quite easy to comprehend how cancer of the uterine cervix could develop as a result of under the guidance of the eye. In subsequent sittings the dilatation is carried out by the use of bougies (Fig. 522). I always introduce the bougie on a guide, which consists of a long piano wire with a small olive-shaped metal tip in the distal end (Fig. 523). On this wire is threaded a long, slender and flexible steel bougie, with which it is pushed through the curved metal tube and through the esophagus into the stomach. The slender

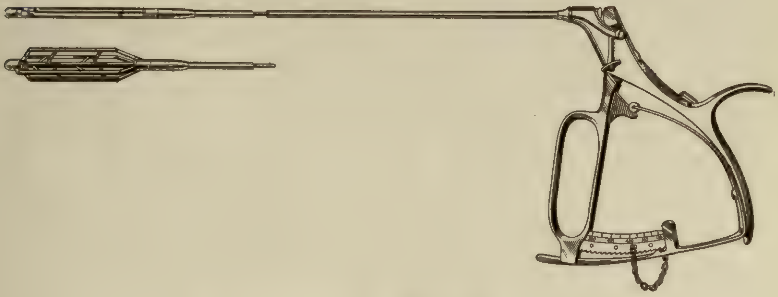

Fig. 521.—Author's esophageal dilator.

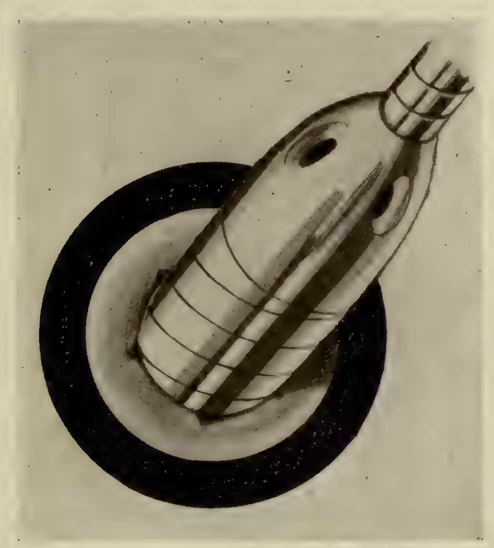

Fig. 522.—Illustrates the yielding of a resistant stricture after multiple incisions.

all lesions of the cervix should be subjected to operative procedure whenever they are found. It does mean that when one discovers a lacerated cervix with a persistent erosion and an irritating leukorrheal discharge that repair of such a cervix by methods which would remove this irritation would be justified and might be the means of preventing the occurrence of carcinoma of the cervix in such a case. Also in cases with markedly cystic cervices, with chronic persistent endocervicitis, one would be justified in the use of operative procedures for the removal of the diseased tissue. At the present time it is not apparent how prophylactic measures can be applied to the development of carcinoma of the corpus.

We can divide the patients with advanced carcinoma who come under observation into two groups:

1. Those who ignore the early symptoms and seek no advice until the disease has spread beyond all possible cure.

2. Those who observe the early symptoms, seek medical advice, and the disease is not recognized in its early stages by their medical advisor.

If the educational campaign against cancer is to be successful it must reach the laity and impress upon them the importance of seeking medical advice at the onset of suspicious symptoms. Further, it must impress on the medical profession the necessity of positive evaluation of early symptoms and signs in the recognition of this disease. The trouble with the education of the medical profession in the past has been that medical men have been taught to diagnose carcinoma by the late rather than the early symptoms of the disease. It is of little benefit to the patient to diagnose carcinoma after the patient is affected with a so-called cachexia, loss of weight, hemorrhage, and foul discharge. These are all late and not early symptoms of uterine cancer. The one important early symptom of uterine cancer is slight bleeding from insignificant or without apparent causes. This may occur as a slight intermenstrual beleding, which may or may not follow slight trauma. It may occur as prolongation or increased frequency of the menstrual periods or a shortened interval between periods. In many it appears as a more profuse or prolonged menstrual flow. Both laity and profession should be educated to appreciate the significance of these symptoms occurring any time after twenty-five years of age. Lay people should consult medical advisors on the first appearance of these symptoms. It is the duty of the medical profession to determine the cause of these symptoms. In the majority of cases it will probably not be carcinoma, but the only way this can be determined is by careful examination of all cases presenting these symptoms. There are many pathologic varieties of cancer of the uterus. From a clinical point of view it is better to group the cases according to the location of the initial growth rather than from the morphologic character of it. I am speaking now of early cases of cancer of the uterus. In advanced cases the origin of the growth is difficult or impossible to determine.

The Treatment of Carcinoma.—Treatment of carcinoma of the uterus will be divided into two main heads:

1. Palliative, for the relief of symptoms and prolongation of life.

2. Curative, when we strive either for a relative or an absolute cure in an effort to prolong or save the life of the individual.

In the main these methods of treatment consist in the application of:

1. *Chemical* or *thermic agents.*
2. *Radio-active substances*, such as x-ray and radium.
3. *Surgical procedures.*

These different methods of treatment will be considered somewhat in detail.

Palliative or symptomatic treatment: This consists mainly of measures used to relieve pain, hemorrhage, and discharge, with the added indication of prolonging life.

Chemical Agents.—Of the chemical agents used for this purpose acetone is probably one of the most important, being applied directly to the carcinomatous growth, with or without excision of as much of the growth as possible. In the use of this therapeutic agent great care should be exercised. The surrounding normal tissues should be thoroughly coated with vaselin and the acetone applied directly to the diseased tissues.

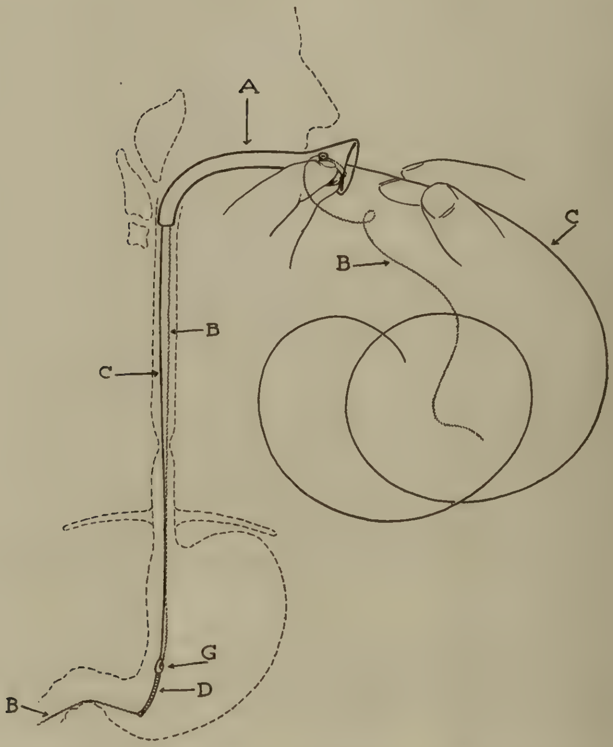

Fig. 525.—The introduction of the *C*, *C* with the very flexible tip *D* on the silk thread *B*, *B*, *B* through the curved tube *A*.

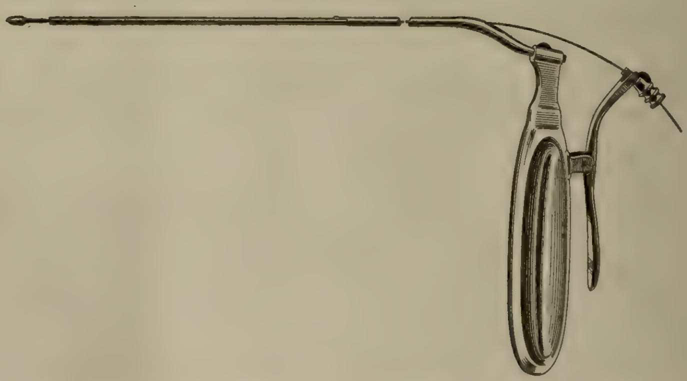

Fig. 526.—Guide carrier operated through the esophagoscope.

following the accident the bougie at no time could have advanced beyond the first stricture, and in all probability not even through the first.

I did not see the patient again for fourteen years. He returned in Janurary, 1923, having been remarkably well until

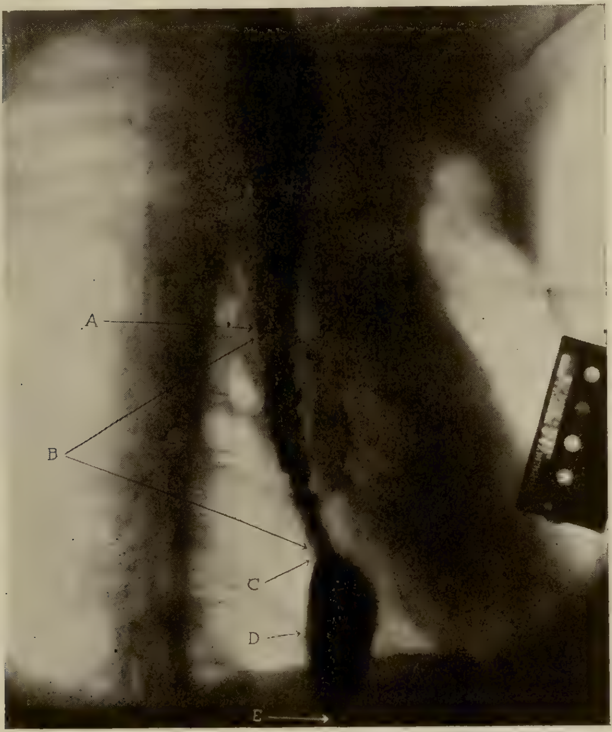

Fig. 516.—Stricture at *A*, and above this large dilatation. *B* showing the irregular, gradually narrowing esophagus. Stricture at *C*. Dilatation at *D*. Stricture near cardia at *E*.

the early part of 1922, in spite of the fact that he had absolutely neglected my instructions as to the after-treatment. Although he could eat solid food up to December, 1922, it had to be very well masticated, and liquids, if too hot or too cold, gave him great trouble. After an attack of influenza in December, 1922, he could take no solid food, it hurt to swallow liquids, and he margin. On inspection we see an eroded or more commonly an ulcerated area on the cervix. The difference between erosion and an ulceration is that in an erosion we have simply loss of epithelium, whereas in ulceration we have some actual destruction of tissue. Where ulceration is present on the vaginal portio one thinks of three conditions—tuberculosis, syphilis, and carcinoma. Any localized or ulcerated area on the cervix which seems somewhat hard to the touch and bleeds easily on contact should always excite one's suspicion of a carcinoma. It may be necessary to make a diagnostic excision in order to make a final diagnosis. One should never hesitate to perform this trivial operation in any suspicious case. In this connection I should like to cite the following cases:

Case I.—Mrs. J. C. Seen in consultation with Dr. C. O. Maland. Married twenty-eight years. Age: fifty-one years. Pregnant six times. Two full term pregnancies. Family history unimportant. Previous history: Measles, mumps, and some rheumatic disturbance. General health has always been good. Weight about stationary. Menstruation established at about eighteen or nineteen years, intervals about four weeks. Has not menstruated for past six or seven years. Has been wearing a pessary for some time.

First came under observation on March 27, 1919, complained of some soreness in the pelvis, which she located in the uterus. This began about two months ago. She has noticed some purulent and bloody vaginal discharge. She had what she calls some "falling of the womb." She has had no trouble with her bladder, but complains of some bearing down sensation in the abdomen.

Examination shows multiparous external genitalia. Perineum fairly competent. Has anterior colpocele. Cervix shows some ulceration on the anterior lip. Bilateral laceration of the cervix, normal mobility, points downward and backward. Corpus shows some retroversion, freely movable, not easily outlined. Palpation unsatisfactory on account of muscular resistance, no adnexal pathology could be felt. The cervix was treated for about two weeks, when a piece was removed for microscopic examination. This examination of the tissue showed no evidence of malignancy. The patient continued under observation with some local treatment of erosion until February 26, 1920. The cervix bled readily on contact, the area of ulceration seemed to have increased in size. The tissue removed for microscopic examination showed the presence of a squamous-cell carcinoma. The patient felt very well, had lost no weight, general condition was good. The symptoms continued about the same as before. On March 20, 1920 a radical abdominal operation was done with complete removal of the uterus and adnexa. The patient refused to have radium treatment. After the operation her general condition improved, and there has been no evidence of any recurrence to date.

Case II.—Mrs. A. E. C. Patient came under observation for existing condition on October 18, 1921. She had previously been under care during one pregnancy on account of hyperemesis, for which it was necessary to perform a therapeutic abortion. She was thirty-four years old, had been married between six and seven years. She had three pregnancies, two of which were full term.

Previous History.—She had cirrhosis of the liver, which was discovered at an operation for appendectomy when the omentum was sutured to the liver. The patient also gave a history of lues acquired eight or nine years before, for which she had been under treatment about two years. She complains of irregular menstruation at intervals of seven or twelve days, which began about six weeks ago. Prior to this menstruation had been every twenty-eight days, lasting five days. About six or seven weeks ago her period came a week early and lasted longer than usual; she passed some clots of blood, which was unusual. She also had some nausea during the week of September 5th. She thought she might be pregnant. On the day that she came for examination she was flowing quite profusely. She had been up and around and quite active physically. Her general health had been quite good.

Examination shows normal multiparous external genitalia, that do not yield to this treatment, and for this type of strictures I devised (in 1907) the method of multiple incisions. This operation is performed through the esophagoscope under the guidance of the eye. In Fig. 519 is shown the esophagotomes that I devised for this purpose.

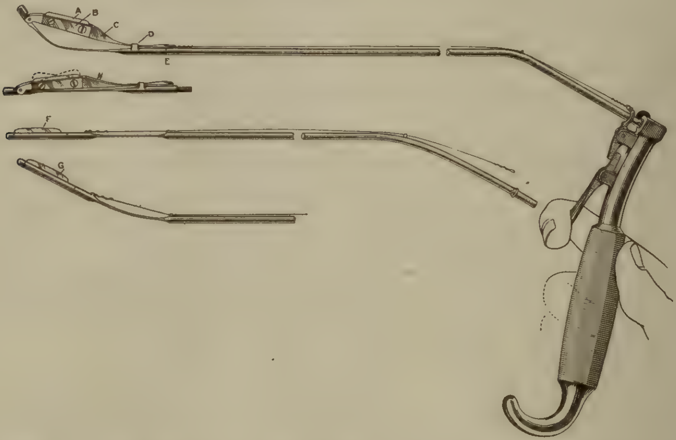

Fig. 519.—An esophagotome for adults in action: *H*, in relaxation. *F*, Esophagotome for children: *G*, in action.

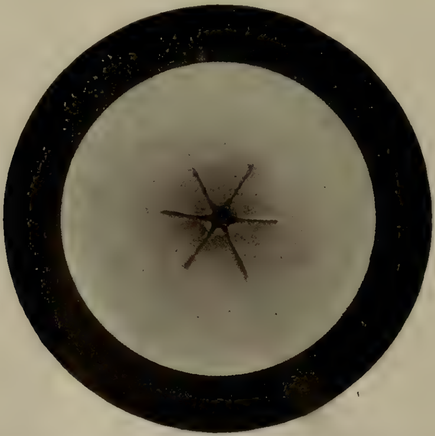

Fig. 520.—Showing multiple incisions in the stricture of the esophagus.

After the incisions are made (Fig. 520) the dilator (Fig. 521) is introduced into the stricture and the first dilation is done

CLINIC OF DR. FRED L. ADAIR

MINNEAPOLIS GENERAL HOSPITAL

CARCINOMA OF THE UTERUS

A CONSIDERATION of cancer is always important not because we have such absolute knowledge regarding its etiology or cure, but because it is such a terrible disease, and its early recognition offers the only possibility of cure.

A great deal is being done by means of propaganda and education in an effort to bring in the cases earlier in the development of the disease, so that we may have a better opportunity of securing a larger percentage of relative and permanent cures. There are probably three main objectives in this educational propaganda regarding cancer:

1. Education of the public to some of the early symptoms of the disease.
2. Education of the medical profession to recognize the disease when possible sufferers present themselves.
3. Probably the most important, to increase our knowledge regarding the etiology and method of cure of the disease.

The uterus is one of the most frequent organs to be affected with cancer, and carcinoma of this organ together with that of the breast make up the vast bulk of cancer cases in women.

The educational campaign is not yielding results which are at all encouraging if one is to judge by the cases of uterine cancer which come into our hands in the Minneapolis General Hospital.

Statistics from the Minneapolis General Hospital.—In the seven years from 1916 to 1922 we have not had a large series of cases at the Minneapolis General Hospital—90 in all appearing in our series. So far as race is concerned, we had relatively few cases occurring among colored people, only 4 of our cases

Case III.—Mrs. E. W. Aged thirty-three years. Married. Patient now complains of:

1. Brownish foul-smelling discharge.
2. "Spotting" between periods.
3. Slight pain in both lower quadrants of abdomen.
4. Urgency and frequency of urination.

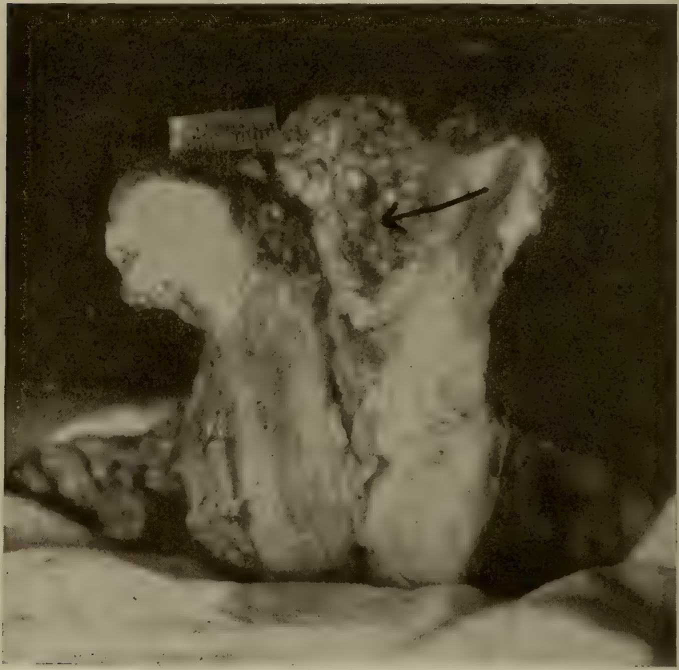

Fig. 531.—Case III. Photograph of uterus removed at operation, showing carcinoma arising within the cervical canal.

Past History.—Housewife. She had gonorrhea when she was eighteen years old, a syphilitic infection for which she has received two or three years of treatment. She has been married twice. Patient had one illegitimate child, forceps delivery, puerperium uneventful. No other pregnancies. She was in an automobile accident, received a fractured skull, seven years ago. As a result of this she lost her sense of smell. She has had scarlet fever, measles, chickenpox. Her general health has always been good. She had an operation about one year ago, when the uterine tubes were removed, together with a piece of the left ovary. She made a good recovery from this operation.

The last two months patient has been working hard at day work, and she has noticed considerable backache the last few weeks, but she ascribes this to her hard work. She has had some slight attacks of pain in the lower abdomen since her operation.

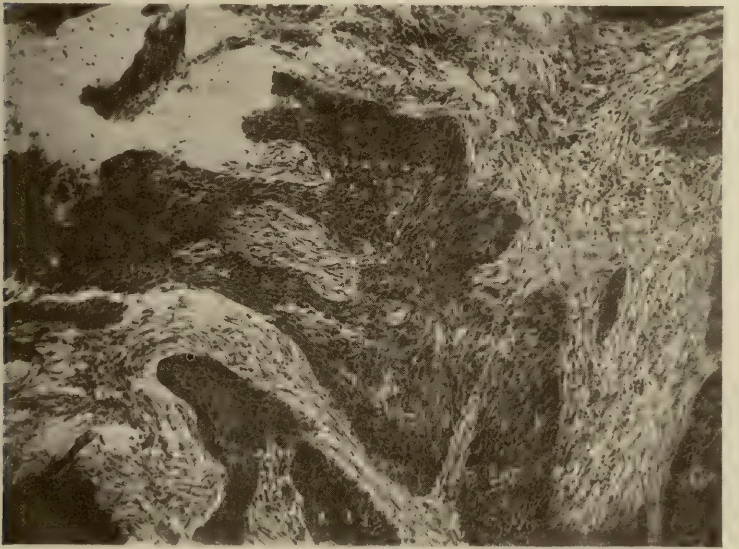

Fig. 532.—Case III. Photomicrograph shows ingrowth of epithelial columns from ulcerated surface. Considerable leukocytic infiltration around epithelial masses. Squamous-cell carcinoma.

About a month ago she noticed a vaginal discharge. She has been told that this has a bad odor. She has been "spotting" between periods for the past month. At first this was only a trace of blood, but for the last couple of weeks she has been using two napkins daily because of the increased amount of bleeding.

Menstruation was established at sixteen. This is of the regular twenty-eight-day type, lasting from five to six days, of case of uterine carcinoma the etiology and prevention of the disease always come to mind. The paucity of knowledge regarding these factors in the eradication and treatment of this disease is continually emphasized in one's mind becaue methods of cure are so unsatisfactory. Etiology has been carefully studied for many years, and this work and study has not yielded the specific results which one would desire. The most interesting recent work is that of Yamagiwa and Ichikawa, who have been successful in producing the so-called tar tumors by the continued external reapplication of coal-tar. They were the first to be successful in the production of this lesion on the rabbit's ear by continued reapplication of coal-tar.

Fibiger inaugurated quite an extensive experimental study of cancer by feeding rats with cockroaches having larval nematods. These rats developed squamous-cell carcinoma of the tongue and stomach in varying percentages. Similar results have been obtained by feeding rats with Tænia crassicollis, producing carcinoma of the liver.

The occurrence of occupational cancer in tar workers, paraffin workers, chimney sweeps, *x*-ray workers, arsenic workers, all points to the rôle of persistent irritation as an etiologic factor in the causation of cancer. It is quite probable, therefore, that there may be no specific cause of cancer, that certain individuals are especially susceptible to the occurrence of irregular and uncontrolled cell proliferation, which may result from a persistent irritation at different sites and in different organs of the human body.

If chronic irritation is the cause of cancer, it is quite conceivable how certain forms of cancer should increase, while perhaps the total number of cancer cases would not be materially greater.

Changes in industry, methods of work, habits of the population, diet, etc., might easily tend to increase certain types of cancer, while perhaps other forms would tend to disappear.

How can the theory of chronic irritation be applied to the development of uterine cancer? It is quite easy to comprehend how cancer of the uterine cervix could develop as a result of

DIVERTICULUM OF THE ESOPHAGUS AND LARGE INTRATHORACIC GOITER

Adult Male. Dysphagia for Many Years. Removal of Intrathoracic Portion and Resection of Right and Left Lobe. Invagination of the Diverticulum. Cure.

P. S., aged sixty-three years, had noticed great enlargement of both sides of the neck, especially the right, for eighteen years, and had increasing difficulty in swallowing. If he tried to drink in the ordinary way he got a choking spell and regurgitated. Dry food troubled him very much. He could not sleep on either side, but slept quite comfortably on his back.

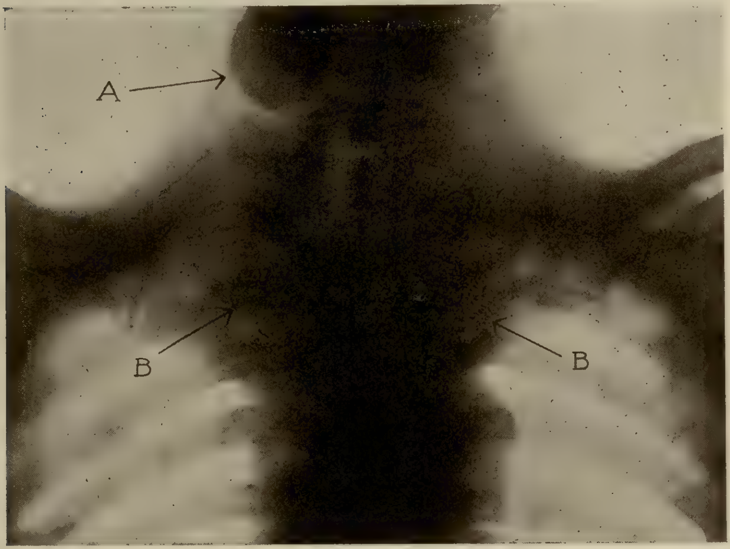

Fig. 527.—Radiograph showing a diverticulum of the esophagus (*A*) and large intrathoracic goiter (*B*, *B*).

On examination his heart action was rather rapid, there was

Microscopic examination of a piece of tissue removed from the cervix reveals a squamous-cell carcinoma.

On January 24, 1923, 50 mg. of radium were inserted into the cervical canal. This was removed prior to operation on January 27th, having been inadvertently left *in situ* and giving an unduly long exposure.

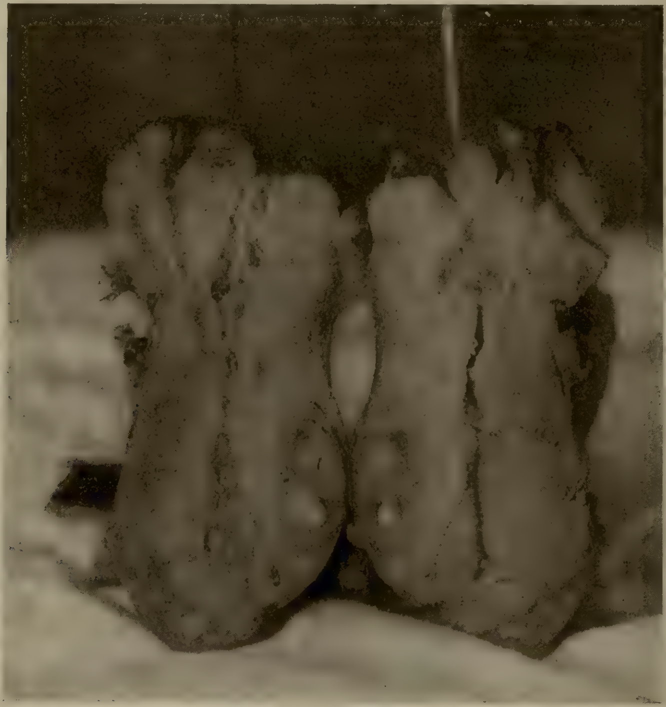

Fig. 533.—Case IV. Photograph of uterus removed at operation. The lower portion of the cervix is almost completely infiltrated with carcinomatous cells. The point of origin of this growth is either on the vaginal part or within the lower part of the cervical canal, probably the latter. There are multiple fibromyomata lying in the wall of the corpus uteri.

The operation was performed as follows:

A midline incision extending from the pubes to navel. Omentum found adherent to abdominal wall. Uterus was retroverted and adherent, was studded with irregular projections, both intramural and subserous. Some were firm and some were soft. The uterus was freed, the ureters exposed, the uterus with tubes, ovaries, parametrium, and vaginal cuff removed *in toto.* Rubber drainage-tubes were placed in the parametrium on either side. The vaginal opening was closed and the peritoneum sutured over the drains and the vaginal wall.

The patient left the table in a poor condition, suffering from shock, which apparently caused death on the following day.

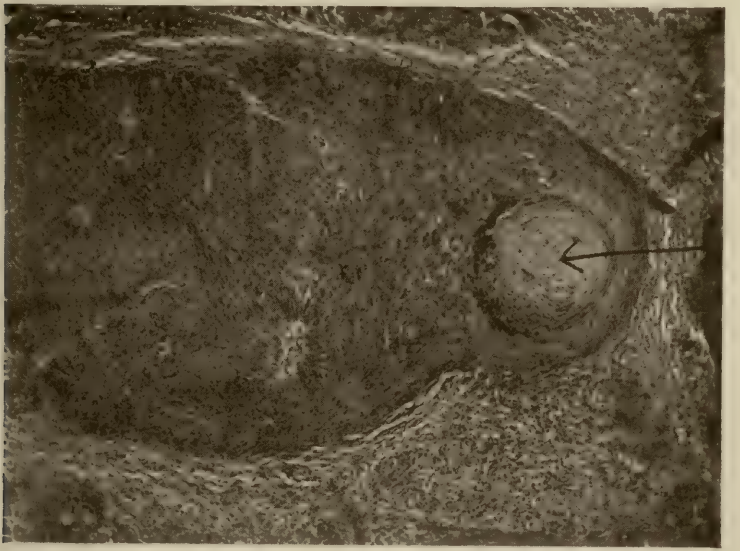

Fig. 534.—Case IV. Photomicrograph showing large island of epithelial cells lying in cervical tissue. A very distinct "pearl" shows marked keratinization of the epithelial cells.

Carcinoma of the Corpus Uteri.—We now come to a consideration of carcinoma of the corpus uteri. In these cases the physical findings are meager. Perhaps a uterus which is slightly enlarged may be found. If one feels justified in passing a sound into the uterine cavity, rather pronounced bleeding is apt to be excited by the use of the instrument even when inserted very gently and carefully. In these cases one must rely upon the diagnostic curet. In performing this curetage, in a sense

rhea ever since she began to menstruate, but this has been more profuse lately. She has not noticed any odor to this discharge. She has some nocturia, but no dysuria.

Examination.—Patient is well nourished, but somewhat anemic.

Bimanual examination: Bartholinian cyst, about 2 cm. in diameter in left labium, tear in right sulcus, small rectocele and cystocele. Urethra negative. Cervix slightly lacerated. Os is patulous. Several polypi can be seen and felt. Corpus in good anterior position, adnexa were negative.

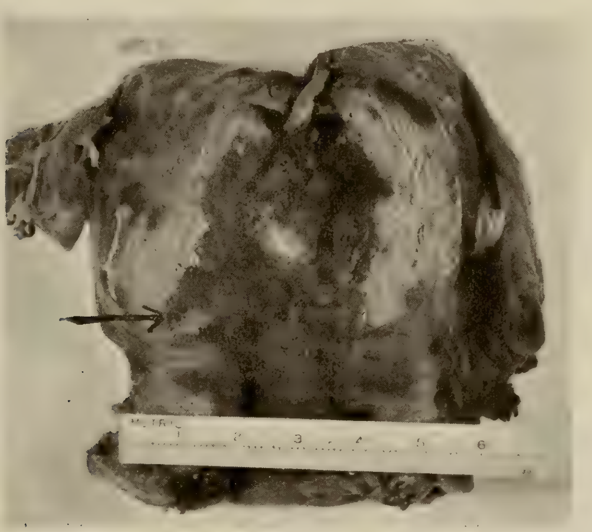

Fig. 535.—Case V. Photograph of uterus removed at operation. Fairly normal multiparous cervix. Markedly thickened endometrium which shows distinct invasion of myometrium at certain points.

First operation on January 25th. Polypi removed from the cervix. On January 27th a sound was introduced into the cervical canal. This produced a grating sensation and readily produced bleeding.

On February 3d a sound was introduced into the uterine cavity. This produced bleeding readily. The internal os was found to be patulous. A piece of tissue removed from the posterior cervical lip showed an erosion. Some tissue was cureted from the corpus and cervix, from which a diagnosis of carcinoma could not be established.

On March 4th the patient continued to bleed. The Bartholinian cyst was removed and a very large amount of soft friable tissue was removed from the body of the uterus. A microscopic examination of these curetings gave evidence of adenoma-malignum.

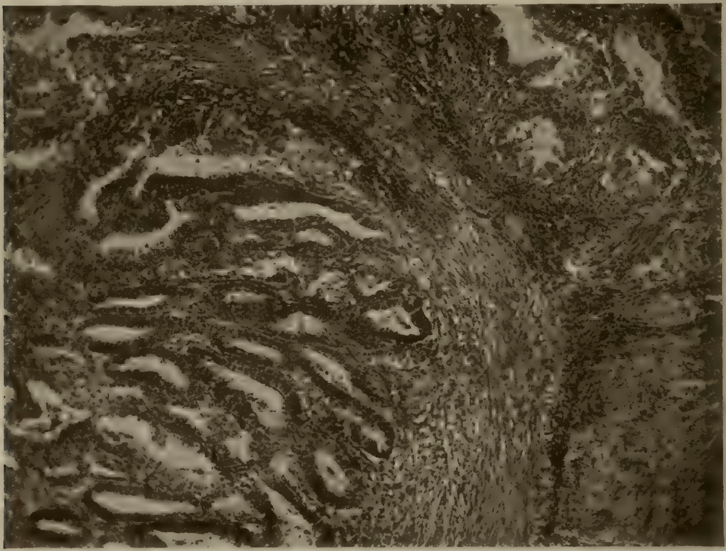

Fig. 536.—Case V. Photomicrograph showing hyperplasia of endometrium with cell and gland proliferation with invasion of myometrium.

On March 11th the patient was subjected to a radical operation. A midline incision from the pubes to the navel was made. The uterus, with tubes, ovaries, parametrial tissue, and some soft glands from the right hypogastric region were removed. The ureters were exposed. During the operation the ligature upon the right uterine artery slipped. In attempting to control the hemorrhage the right ureter was accidentally clamped. The patient made a smooth convalescence. She had no trouble as a result of the injury to the ureter. Microscopic examination confirmed the diagnosis made from the cureted tissue. The lymph-glands showed no metastases.

The patient was living and well nearly six years following the operation.

Conclusions.—1. If we are to diagnose carcinoma of the uterus early the laity should be educated to recognize slight symptoms, and physicians should carefully follow up recent symptoms in order to pick up carcinoma of the uterus early in its development.

2. One should not befog the diagnosis with too complicated classifications of uterine carcinoma. There are three locations in which carcinoma of the uterus may be found. These three sites should always be searched for its presence. They are:

(1) Vaginal portio.

(2) Cervical canal.

(3) Corpus uteri.

3. Absolute diagnosis may require minor surgical operations, such as excision or curetage.

4. Prevention of carcinoma has at the present time no scientific foundation, except possibly the elimination of persistent irritation.

5. Early detection is at the present time the only basis for favorable prognosis.

6. Treatment is palliative and symptomatic, and should be used to make the patients more comfortable and prolong life.

7. Relative and permanent cures should be sought for in favorable cases, using all possible agents to affect a cure, such as heat, radium, deep x-rays, and radical operation.

UROLOGIC CLINIC OF DR. GILBERT J. THOMAS

UNIVERSITY OF MINNESOTA

PAPILLARY CARCINOMA OF THE RENAL PELVIS IN A CHILD OF THREE AND ONE-HALF YEARS

I WAS asked to see a patient with Dr. N. O. Pearce of the Minneapolis Children's Clinic because of hematuria and a mass in the left renal area.

The patient was a little girl three and one-half years of age.

Past History.—Slight difficulty with diet during the first few months of her life. At twenty-two and one-half months the patient had measles. The recovery was good; there were no complications.

The **present trouble** began March 10, 1922, at which time the mother noticed blood in the urine. The patient was somewhat irritable and fussy and had an afternoon temperature of 99.4° F. The day before the hematuria was noticed the child was exposed to cold and she had wet feet. About five days before the present trouble she stumbled and fell on her back, striking on her doll's head, which injured the lumbar region. This injury was not a severe one. The patient did not complain of one side more than the other. The mother says that the child cried at the time for about one minute and not afterward. There were no external signs of injury.

General examination revealed large tonsils and cervical glands. A mass was felt in the left lumbar region below the costal margin. On inspection, fulness was seen on deep inspiration in the left upper abdomen under the costal arch. The mass was not tender. The patient had no pain. She had a temperature of 99.6° F, but there was no other evidence of infection. She had not lost weight. The hemoglobin was 85 per cent.; Red blood-count, 4,500,000.

Five days after the first hematuria a cystoscopic examination was made under gas anesthesia. A normal bladder was found. No urine could be seen spurting from the left meatus. The right meatus expelled a large amount of clear urine. Catheters passed with some difficulty through both ureters and into the kidney pelves. Urine containing blood was obtained from the left pelvis. The urine from the right was clear. A bilateral pyelogram was made. The outline of the right pelvis was normal. On the left side the pelvic outline was large. The calyces were dilated and the ends clubbed. No retraction or other deformity usually seen with a renal tumor was observed. A single cyst into which a blood-vessel had ruptured, because of recent trauma, was thought of, but it is unusual to find a dilated pelvis with this condition (Figs. 537–539):

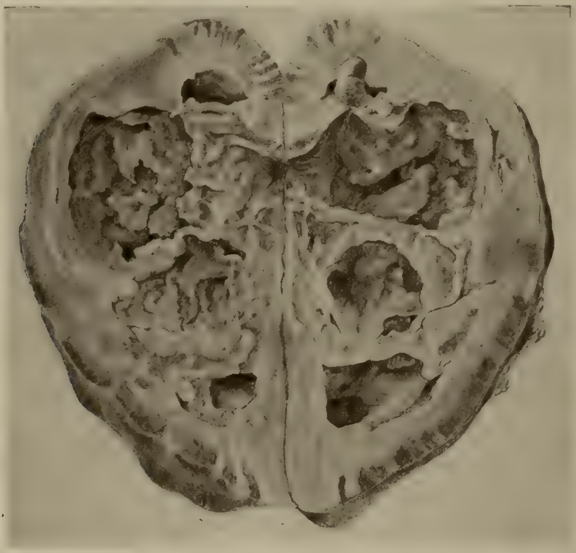

Fig. 537.—Case I. Papillary carcinoma of left renal pelvis in a child. Papilloma filling the pelvis, causing dilatation of calyces with some destruction of the cortex.

Our clinical diagnosis at this time was: (1) Trauma with bleeding causing acute hematonephrosis, (2) congenital cyst or other anomaly with bleeding from trauma, (3) neoplasm of pelvis of kidney causing hematonephrosis.

We advised that the patient be kept quiet in bed in the hospital and that she be watched carefully. During the next four days the mass did not decrease in size and blood was noticed in the urine on several occasions, although this was intermittent.

After two weeks the mass was not smaller; probably more tense than before, with no tenderness, and blood was noticed occasionally in the urine. The patient had gained 1 pound in weight. Her general condition was good. She played normally. It was decided that an exploration was advisable, as the tumor did not decrease in size and the urine remained hemorrhagic.

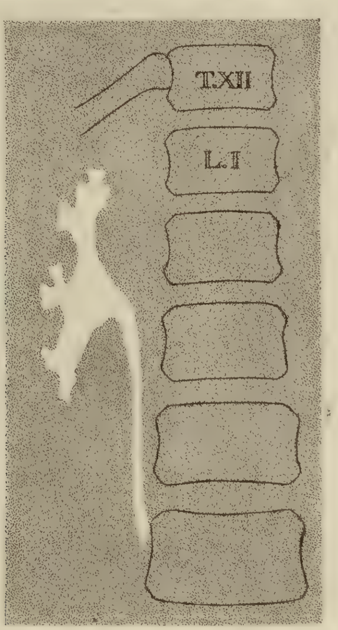

Fig. 538.—Case I. Papillary carcinoma of renal pelvis in a child. Pyelogram of right kidney. Normal pelvic outline.

A left lumbar incision was made, exposing a large kidney for a child. The organ was very adherent to the surrounding tissues. Large dilated vessels could be seen over the capsule.

The kidney substance was very friable. The pelvis was greatly distended and thinned. The kidney was carefully dissected from the adjoining tissue and partially delivered. When isolating the ureter to facilitate the delivery of the kidney the pelvis ruptured, filling the wound with blood and papillomatous material. The ureter was tied separately. The pedicle was isolated and ligated twice, after which the tumor was removed. No glands were palpable, although a dissection outside the kidney fossa was not done. Penrose drains were put into the kidney fossa down to the pedicle. The patient made a good immediate recovery from the operation. On the second day her temperature was 102.6° F. The temperature gradually subsided, so that on the fifth day it was normal.

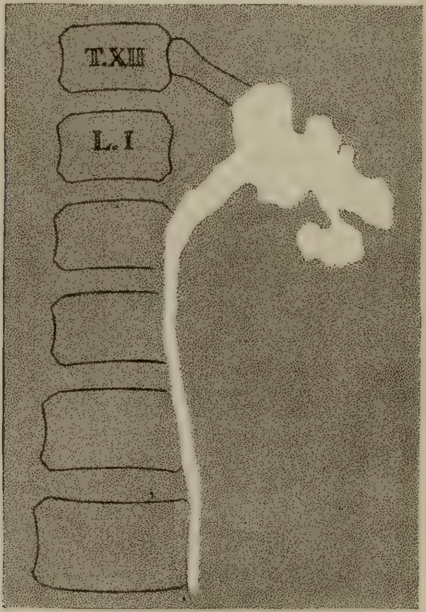

Fig. 539.—Case I. Papillary carcinoma of renal pelvis in a child. Pyelogram of left kidney. Pelvic outline irregular with some dilatation. Ureteropelvic juncture somewhat wide.

Dr. E. T. Bell, Chief of the Pathologic Department at the University of Minnesota, examined the specimen. His report is as follows:

"The tumor from the renal pelvis shows a fairly smooth deep surface, that is, it does not infiltrate the walls of the pelvis to a notable extent. Microscopic sections show a tumor composed of squamous epithelium in large masses. There is only a moderate invasion of the underlying tissues. No extensions out to the surface of the pelvis. Diagnosis: Malignant papilloma of the pelvis.

"Prognosis: Follow-up records of this type of tumor are insufficient to give a basis for an accurate prognosis. The gross and histologic structure of the tumor indicate rather clearly, however, that it is a growth of moderate malignancy."

"There is a gradual transition from a benign papillary tumor of this type to those which are definitely carcinomatous with metastases. It is difficult, in an individual case, often to estimate the exact degree of malignancy. On the basis of 4 as maximum malignancy, this would probably be graded as 2."

Ten days following operation 50 milligrams of radium screened with ordinary thickness of rubber tubing were introduced through the proximal end of the incision for six hours. This was followed by *x*-ray treatment over the left abdomen from Poupart's ligament to the costal arch.

June 14, 1922, or two months following operation, the patient was examined and found in good condition. She had gained 1 pound since operation. There was no evidence of metastasis or enlarged glands. The patient looked and acted well. Her color, etc., was normal.

July 10, 1922, a small mass was felt just above the crest of the ileum on the left side which was not easily movable. This was not painful, and as the child's bowels had not moved, a filled colon had to be considered.

July 14, 1922: Fifty milligrams of radium screened with $\frac{1}{2}$-inch of hard rubber and three folds of gauze were placed over the tumor area for twelve hours. There was some nausea the next day; otherwise not much reaction. The bowels were hard to move. The tumor was not as prominent after a bowel movement.

July 24, 1922: The general condition of the patient was about the same except that she complained of pain in the left side. The bowels were hard to move. The tumor was somewhat larger. Fifty milligrams of radium with ½-inch hard rubber and four folds of gauze as a screen were placed over the tumor for twelve hours.

The patient's condition did not improve. She had continuous pain in the side and increasing trouble with bowel movements.

August 3, 1922: The patient had convulsions so that chloral and codein had to be used for pain. Her condition became gradually worse. She had to be held most of the time because of pain.

On September 22, 1922 the patient died. A postmortem could not be obtained.

Comments.—Suspect malignancy in every patient with renal bleeding, irrespective of age. A pyelogram which has an enlarged pelvic outline or hydronephrosis with renal bleeding is, in the majority of instances, caused by a renal-pelvic or ureteral tumor, if stone is eliminated.

This patient had a renal tumor for some time before the history of trauma. The trauma was coincidental and probably had nothing to do with the tumor or with the bleeding. The patient may have had hematuria for some time before the mother noticed it. The tumor grew rapidly, because when examined by her physician a few months before the present trouble, no masses were palpable. The general health of the patient was good in spite of the fact that she had a malignancy in the pelvis of her kidney.

The subsequent history indicated that metastasis into the glands had occurred before the operation was done, although in the adult metastasis does not occur early with tumor of the renal pelvis.

Cystoscopy and pyelography are not done as often as they should be in children. Babies of one year may be cystoscoped with ease. Small instruments are now made so that the infant bladder can be examined with little difficulty. An anesthetic is usually necessary. With small babies 20 grains of chloral given per rectum is a very satisfactory anesthetic. Pelvic lavage and pyelograms may be done when necessary.

It is possible to make an accurate urologic diagnosis in the child as well as in the adult if cystoscopy, ureteral catheterization, and pyelograms are made.

URETHROCELE

I WAS asked to see a young married woman a few days ago because the attending physician when attempting cystoscopy had been unable to catheterize the ureters.

The **previous history** is not complete.

The patient had two or more confinements, one (I think the last one) being a prolonged, hard labor, following which she had some repair work done.

Her **present trouble** was frequency of urination, of small amounts of urine, pyuria, and a tumor presenting superiorly into the vagina, which was diagnosed a cystocele. The attending physician thought that the difficulty experienced in catheterizing the ureters was due to distortion or displacement of the base of the bladder caused by a cystocele. The patient's general condition was excellent.

The **roentgenographic examination** of the kidneys, ureters, and bladder was negative.

The **urinalysis** revealed pus in moderate amount.

Cystoscopy disclosed the following: The cystoscope passed easily into a cavity about as big as a good-sized lemon. This cavity could not be completely distended because the irrigating fluid escaped around the cystoscope. There was no urethra, as the cystoscope dropped into a sac as soon as it was introduced through the meatus. The mucosa looked as if it had just recovered from a chronic inflammation. No ureters could be found. The sac was carefully searched for fifteen or twenty minutes without finding an ureteral meatus or other opening. Indigocarmin was given intravenously to help locate the ureteral openings, but this did not assist, as no blue color could be seen in the fluid filling the sac. The fluid had to be changed frequently, so that I may have missed a slight blue color. A congenital anomaly with ureters opening into the roof of the bladder was considered. Finally, a small opening could be seen at the extreme upper posterior part of the cavity. This opening was very hard to see. The direct vision cystoscope was pointing toward the ceiling and the eyepiece toward the floor when the opening was in view. After several attempts two No. 6 French, shadow-casting catheters were introduced through this opening.

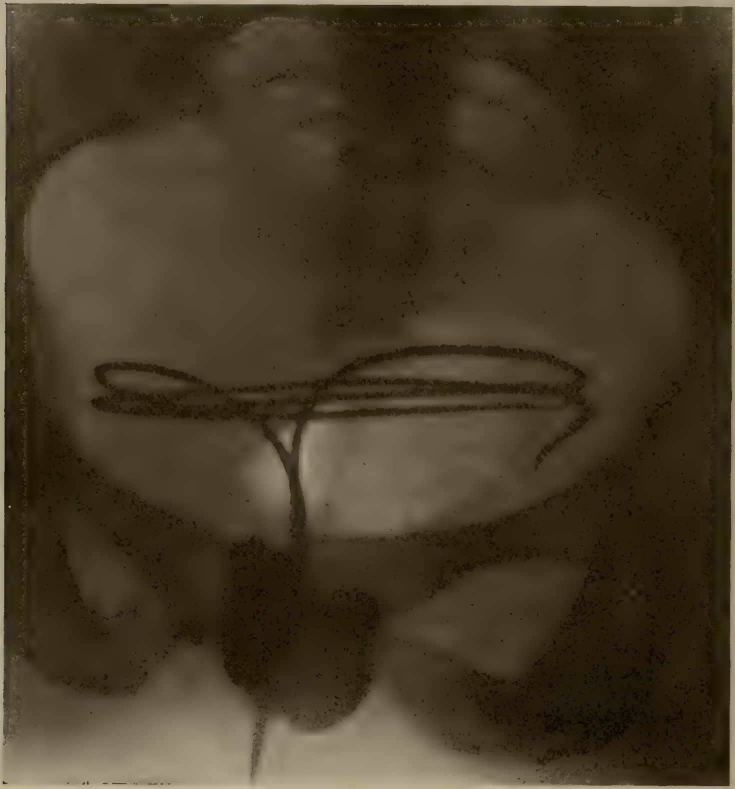

Fig. 540.—Case II. Urethrocele. Radiogram showing urethrocele filled with 15 per cent. sodium iodid. Shadow-casting catheters coiled in the urinary bladder.

Blue colored fluid was obtained immediately through both catheters. From one the color was concentrated, while the fluid obtained from the other was pale. This finding indicated the probability of the catheters having found their way into the ureters. Since only one opening into the bladder could be found, I considered the possibility of the ureters having joined near the bladder, into which they opened by one common opening. The catheters when passed through this supposed ureteral orifice felt as if they had dropped into a cavity. There was not the usual resistance found when catheters pass through the normal ureter. A roentgenogram was made to determine the position of the catheters. They were found coiled in the urinary bladder,

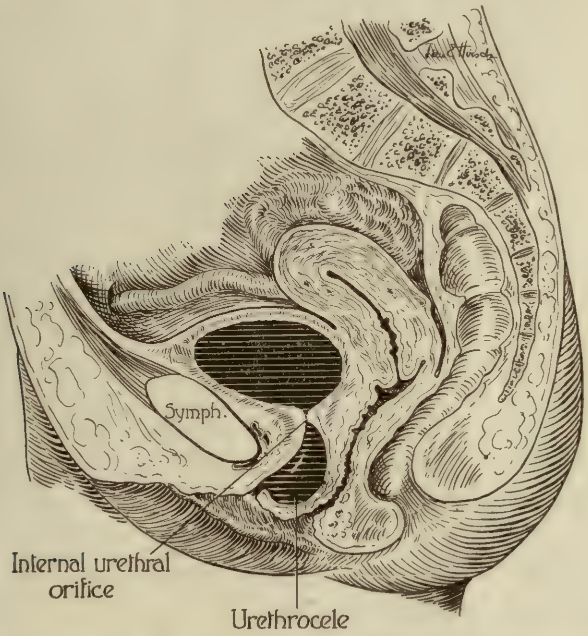

Fig. 541.—Case II. Urethrocele. Diagrammatic sketch to show the relation of the urethrocele to the bladder and adjacent organs. Longitudinal section.

which was apparently in normal position and had a normal shape. The urethrocele was filled with 15 per cent. sodium iodid solution and a roentgenogram made. The accompanying reproduction (Fig. 539) shows the coiled catheters in the bladder and the urethrocele. A drawing of a longitudinal section through the pelvis is reproduced to show the position of the urethrocele (Fig. 540).

REPORT OF A CASE OF HYDRONEPHROSIS OF THE RIGHT KIDNEY OF UNKNOWN ORIGIN

The patient is a female, aged twenty-four years, who came to the clinic complaining of a tumor in her right side, together with hematuria.

Family History.—Mother died of paralysis, cause unknown. Father is living and well. She has one sister who is well.

Past Illnesses.—Negative. The patient states that she does not remember having been sick before her confinements. She has never had previous operations, accidents, etc.

Menstrual History.—Menses have been irregular. Patient has missed two to four periods at a time. When her flow is present it lasts one week and is not profuse.

Obstetric History.—Patient has 2 babies, 1 two and a half years old and 1 five weeks old. Her confinements were uncomplicated, and in both instances she made a complete, satisfactory recovery. She has been married five years.

Present History.—Began in May, 1921, at which time the patient was pregnant three months. She developed a very severe pain in the right upper abdomen which radiated to the back. This was accompanied by hematuria and lasted almost continuously for two weeks. The patient was in bed all of the time and vomited constantly. She was very constipated. As soon as she was able to get out of bed she was moved to a hospital, where a general study of her condition was made. Physical examination did not reveal the cause of her pain.

After five days' rest in the hospital pain and hematuria disappeared and she went home. At this time the patient noticed a tumor in her right side. She thinks it was about the size of a small orange. Two weeks later she had a similar attack. The pain, however, was not as severe as before. The swelling was more pronounced and the hematuria returned. She was again taken to a hospital for study. A cystoscopic examination was made, but no definite diagnosis arrived at. Following this attack she had backache which continued through her pregnancy, but she did not again notice the hematuria. The tumor in the right side continued to enlarge until it was easily felt in spite of the enlarging uterus. The patient was confined at nine months and gave birth to a normal baby weighing 8 pounds. Following her confinement she had no backache, her strength returned, she regained her lost weight, but noticed that the tumor in her side continued to enlarge. Her only symptoms were tumor in the right side and hematuria.

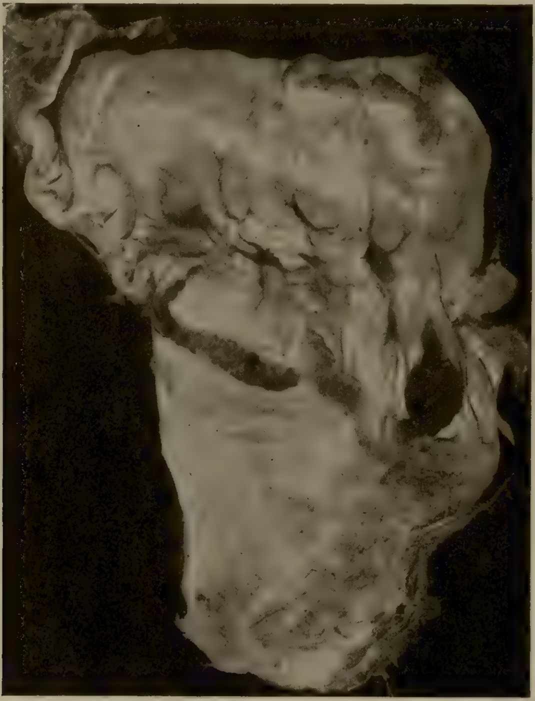

Fig. 542.—Case III. Hydronephrosis of right kidney. Photograph of the interior of the pelvis of the kidney showing the tears from which hyperplastic scar tissue has grown. These are elevated, elongated structures having a superficial resemblance to papillomata with their long axes corresponding to the long axis of the kidney.

The physical examination was practically negative except that a large tumor, which was rather tense and about the size of a baby's head, was found in the right kidney region. The pelvic examination revealed the tumor pushing the uterus posteriorly, where it was held. On inspection of the abdomen the tumor was easily seen. The patient's hemoglobin was 35 per cent., with a normal leukocyte count.

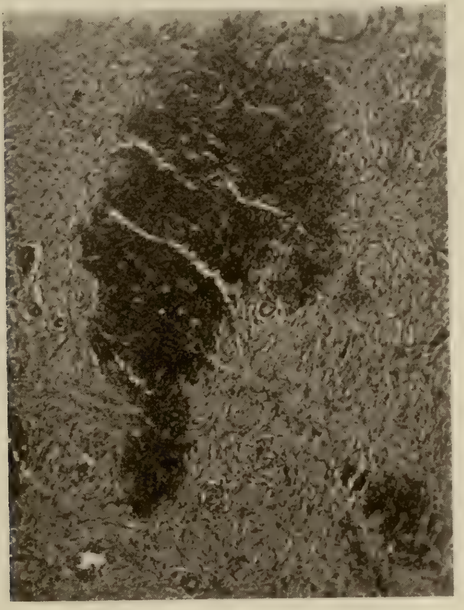

Fig. 543.—Case III. Hydronephrosis of right kidney. Microphotograph of section through one of the hyperplastic scars, showing dense scar tissue and hemorrhage.

Cystoscopic examination revealed the bladder to be negative. Hemorrhagic urine was seen spurting from the right ureter, and clear urine from the left side. A ureteral catheter passed easily on the left side; clear urine was obtained. It was slightly difficult to introduce the catheter through the upper end of the right ureter. Force was not used. Bloody urine was obtained through this catheter. With a syringe 5 to 6 ounces of hemorrhagic urine were removed from the kidney pelvis, after which the tenseness of the tumor lessened considerably. The catheter was allowed to remain in the right ureter for forty-eight hours. A pyelogram of the left kidney was made to determine its position and the pelvic outline. Both of these were normal. The function of this kidney was found to be good. The following day the tumor was very soft, as the catheter had continued to drain urine for twenty-four hours.

A provisional diagnosis of hematonephrosis was made, the cause undetermined. Papilloma of the pelvis of the kidney which had grown into the ureter and produced obstruction was thought of. A previous *x*-ray examination had not revealed the outline of either kidney or stone shadows.

The patient was operated upon, under gas-ether anesthesia, on January 30, 1923. The lumbar kidney incision as described by Mayo was used. A large tense tumor was found which was dissected from the surrounding tissue with great difficulty. It was very hard to introduce the hand either behind or in front of this tumor, as it entirely filled the right abdomen and right pelvis. A trocar, such as is used for drainage of the urinary bladder, was plunged into the tumor and a rubber catheter was sewed by a purse-string suture into this opening. Very little, if any, of the tumor contents was spilled. The sac was slowly emptied and 2000 c.c. of bloody fluid obtained. Anteriorly the duodenum was found to be adherent to the sac. This was carefully dissected off. The ureter was isolated. It was not enlarged. There was no evidence of an anomalous vessel of band or other obstruction in or around the ureter. The difficulty found when attempting to introduce the ureteral catheter was caused by the right angle turn which the ureter made before it entered the pelvis. The ureter passed outward from the spine and entered the tumor at its lower outer corner, where it entered at right angles. The pedicle was eventually isolated, the vessels being very small. After the pedicle had been tied in two places with chromic gut the sac was removed. No accessory kidney could be felt. No glands were palpable. The kidney fossa was drained with several Penrose drains. The usual closure in layers was made.

The patient developed a rise of temperature and a severe bronchitis on the third day. She recovered from her bronchitis by the sixth day, and after that her convalescence was uneventful.

This report is of more than ordinary interest because the specimen did not show any evidence of kidney tissue. The bleeding which produced the hemorrhagic fluid from this side was probably caused by tears in the interior of the sac from the increasing pressure. We could find no cause for this tumor unless it was a congenital anomaly. The patient did not give a previous history of having passed stones or having had any trouble in this or in the kidney on the other side. There was no evidence of papilloma. The red spots which can be seen in the accompanying photograph are hemorrhagic areas of connective-tissue formation, bleeding being caused by the splitting of the sac from overdistention.

REPORT OF A CASE OF GRANULOMA OF THE URINARY BLADDER

In my experience this is very unusual bladder lesion.

The patient is a female, aged twenty-seven years, a teacher by profession. She came to the clinic seeking relief from frequency and burning at urination.

Family History.—Her father has diabetes or some kidney trouble. One brother died of scarlet fever. Otherwise the family history is negative. The patient is one of 8 children.

Previous Illnesses.—Measles and mumps during childhood. Quinzy sore throat frequently up to four years ago, when the patient had a tonsillectomy. She is a frequent sufferer from colds and has a cough most of the time. She has a history of food distress, indigestion, and pyrosis. This has not been present for the last two years. The patient had enuresis as a child, and has had to urinate two or three times every night since that time.

Menstrual History.—This began at twenty years of age, when it was regular and of a twenty-eight-day type. After two years it became irregular. At this time her menses came once every two or three months, when she flowed for one day only, During the last two years her periods are regular, but the flow is very scant.

Venereal.—Neisserian infection suspected two years ago. This history is questionable, as Neisserian organisms were not found.

Present Trouble.—About March or April, 1920, the patient had a sudden onset of fever and chills, supposedly a cold, with severe headache and pain in the lower abdomen and pelvis. She was in bed for six weeks following the onset. During this time she had severe urgency and burning at urination, with a vaginal discharge. During the summer the patient was not well, but was not bedridden. In September she was able to teach school again. Her bladder was lavaged constantly and she was taking urotropin and tincture of hyoscyamus by mouth. At this time pyuria and frequency were troublesome. In December the home physician made a cystoscopic examination. The patient was told after this examination that her trouble was confined to the bladder and urethra. She does not know if the ureters were catheterized. Bladder lavage was continued without relief from symptoms. She had a second acute attack about two weeks before I first examined her. At this time frequency, burning at urination, and pyuria were present. The patient appeared very ill.

Physical Data.—General impression: The patient is a young woman with a slightly anemic appearance. She was somewhat nervous and fidgeted in her chair as if she wished to urinate. Her temperature was 99.4° F., pulse 80, blood-pressure 114/70.

The *head examination* was negative except that the tonsils had been removed, leaving old scars in the throat. A slight inflammation of one inferior turbinate.

Neck examination negative.

Chest: Heart area normal. Systolic murmur at base, disappears on sitting up. Lungs clear throughout. Fluoroscopy: Left ventricle appears pulled to left and there is a little lagging of the left diaphragm. Stereoscopic plates of chest reveal a high diaphragm on the left side, probably pushed up by gas. The heart is a mitral type. There is a marked hilus infiltration on the right side. There is a fan-shaped involvement of the parenchyma extending to the periphery and involving the apices on both ides. *Plate diagnosis:* Incipient pulmonary tuberculosis, questionable.

Abdomen: Right kidney palpable and somewhat tender; otherwise negative,

Pelvic: Marked edema of labia minora and tissues around introitus. Uterus in anterior position, normal size. Left tube and ovary normal. Right tube palpable, hard, and indurated; suggestive of a chronic inflammation. Nothing acute. Right ovary normal.

Extremities: Normal; no edema or skin markings.

Urinalysis: The first specimen of urine contained albumin ++++ and 40 to 50 pus-cells per high-power field. The phenolsulphonephthalein test was 48 per cent. The urinary sediment was stained for tubercle bacilli, but with negative results.

Roentgenography of the urinary tract was negative for stone. The outline of neither kidney was visible.

Blood studies: Hemoglobin 40 per cent. Red blood-cell count 3,016,000; white blood-cell count 6700. Polymorphonuclears 76; large lymphocytes 1; small lymphocytes 20; transitionals 2; basophil 1. Wassermann test, three antigens, all negative.

Cystoscopy was done under gas anesthesia. A cystitis which was generalized and graded 3 on a scale of 4 was found. No ulcers were observed. Catheters were passed into both ureters with ease and turbid urine was obtained from both sides. Indigocarmin returned in five minutes from both sides. Bilateral pyelo-ureterograms revealed chronic infection, the ureters being somewhat dilated. Ureteral specimens collected for microscopic examination contained pus. The sediment was stained for tubercle bacilli, but none was found. Vaginal and urethral smears were made repeatedly, but were negative for gonococci.

Dental examination: *x*-Ray disclosed 2 badly abscessed and 2 devitalized teeth.

My diagnosis was: (1) Bilateral pyelonephritis and cystitis; (2) chronic infection of right tube; tuberculous, questionable; (3) vaginitis and endocervicitis; (4) incipient pulmonary tuberculosis, questionable; (5) caries of teeth.

Treatment consisted of removal of foci of infection, regular pelvic lavage every five days, and daily bladder irrigations. Arsenite of iron was given intramuscularly once a day. The bladder symptoms subsided somewhat, so that ten days after the first cystoscopy the bladder was more tolerant and the cystoscope could be passed without a general anesthetic. The cystitis had improved greatly. The catheterized ureteral specimens of urine contained less pus.

Six weeks after the first examination the bladder mucosa was clear except for an area on the posterior superior wall which was very red, but not raised. This area was very tender and bled easily. The catheterized ureteral specimens contained only a few pus-cells.

Nine weeks after the first examination the general condition of the bladder mucosa was good except one area on the posterior superior wall about the size of a silver dollar. The middle of this area was raised, very red and tender, and bled easily. The catheterized ureteral specimens were negative and no growth could be obtained on culture. The patient complained of her bladder both night and day. Although our treatment had improved her somewhat, in that her general condition was good, she was miserable and discouraged. Rest in bed helped some, but her symptoms returned with their usual severity when she was on her feet. I had tried all the usual bladder irrigations and topical applications without relief. Autogenous vaccines did not help. The bladder urine contained only a few pus- and blood-cells. I advised the patient to have the area in the bladder removed surgically because of the possibility of beginning malignancy.

A suprapubic cystotomy was made. An area the size of a five-cent piece which was raised at the edges, depressed in the center, and somewhat indurated was found in the location as observed with the cystoscope. This small section of the bladder was surrounded by an area the size of a silver dollar which was very red and bled easily. Resection of the bladder wall well outside the affected area was done. The bladder was closed without drainage. A Penrose drain was put into the prevesical space. An indwelling catheter was introduced through the urethra. The bladder healed in about ten days. The catheter was removed after two weeks. There was a slight suprapubic drainage, but this diminished quickly until the wound closed completely. A distinct colon odor was noticed during the few days that the bladder drained suprapubically. This was quickly controlled by mercurochrome (2 per cent.) injections through the catheter. While in bed in the hospital following the operation the patient seemed to be free from bladder symptoms. However, after she was home for one month her bladder symptoms returned.

Cystoscopy five months after operation revealed a red, easily bleeding, not raised area of inflammation $1\frac{1}{2}$ by $\frac{1}{2}$ inches, on the posterior wall of the bladder. The catheterized bladder urine contains six to eight pus-cells per high-power field. The catheterized ureteral urines were negative except for a few blood-cells. Cultures were negative. Pure silver nitrate fused on a probe was used to cauterize this area through the Kelly direct vision cystoscope. The immediate reaction was severe, but after this had subsided the bladder symptoms were better. The patient has not returned for a second treatment.

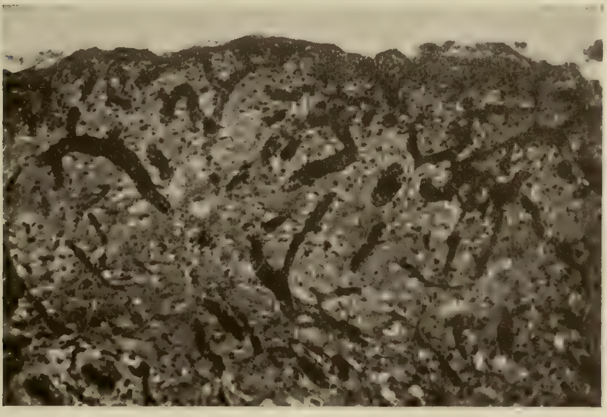

Fig. 544.—Case IV. Granulation tissue showing a large number of capillaries filled with polymorphonuclear leukocytes. There is no epithelial covering.

Sensitization tests for all food groups and for animals were negative. The patient has gained 10 to 12 pounds in weight since operation and feels fine except the bladder soreness and frequency.

Dr. E. T. Bell's report of the specimen removed is as follows:

"The tissue submitted for examination consists of a growth about 2 cm. in diameter and of rounded shape. The surface which is continuous with the mucosa of the bladder is reddish and roughened and suggests granulation tissue. Sections through the growth, examined with the naked eye, show a superficial growth which appears to extend down to the muscularis. It measures from 2 to 4 mm. in thickness. It has a hemorrhagic appearance and the under surface forms a rather even line, that is, there appears to be no infiltration beyond the limits of the mucous membrane.

"Microscopic sections show a thick layer of vascular granulation tissue. There are large numbers of capillaries each containing a number of polymorphonuclear leukocytes. The tissue between the capillaries shows extensive interstitial hemorrhage and a great many mononuclear leukocytes, some of which are of the plasma-cell type. There are a very few polymorphonuclears outside of the blood-vessels. The surface shows no epithelial covering. In the deeper parts of the mucosa the blood-vessels are surrounded by thick zones of mononuclear leukocytes, and the blood-vessels in the muscular layer show a few of the same cells surrounding them.

"Diagnosis: A growth composed of granulation tissue. This type of growth corresponds exactly to a growth on the skin which is now called granuloma pyogenicum by dermatologists."

There are many diagnostic possibilities concerning this lesion from a clinical point of view. However, the pathologist throws many of them out as impossible after he has completed his study of the tissue. I was tempted to let the bladder alone without resection. The patient demanded that something be done to relieve her as soon as possible. The question of malignancy led me to resort to surgery instead of waiting. Pure colon infection in the bladder might produce such a condition which is very hard to cure. Tuberculosis had to be considered, although a single ulcer in this location is rare with negative kidneys. Syphilis was thought of, but we could find no additional evidence. A tube or other organ adherent to the bladder might produce such a condition, but when there is pressure on the bladder, the picture with the cystoscope is quite different from what we have here.

Certain kinds of food have produced chronic inflammation or irritation in the bladder. The patient was tested for sensitization toward foods, with a negative result. Our next step will be to advise the patient to submit to regular hygienic treatment together with actinotherapy as used for tuberculosis.

AN EMERGENCY METHOD OF CONTROLLING HEMORRHAGE FROM THE PROSTATIC URETHRA FOLLOWING THE PUNCH OPERATION

THIS is the second instance in which it has been necessary for me to control a prolonged severe hemorrhage following the punch operation. The first time I packed the prostatic urethra and neck of the bladder through a cystotomy incision.

The patient now under consideration is an old man of seventy-seven years who had a prostatectomy five years before the present trouble. I discovered a median bar and a part of two prominent lobes (the right lateral and median) which had recurred, or were left at his previous operation. When the patient consulted me he was able to void very little, as most of his urine was residual. The patient's general condition was good. His blood-pressure was within normal limits for a man of his age. The heart seemed to be in good condition. The blood chemistry was normal. Urinalysis demonstrated only an occasional pus-cell.

Under caudal anesthesia the punch operation as described by Young was done with the Braasch modification of the Young instrument. Several bits of prostatic tissue were removed. Before the sheath of the punch was withdrawn two small spurters could be observed in the area operated on. A large soft-rubber catheter was introduced through the urethra and into the bladder, following which the prostate was massaged. This method, before this experience, had always controlled hemorrhage in such cases.

Following the operation the patient's urine continued bloody, and on the third day, because of hiccoughs or a sudden attack of coughing, the catheter was forced out. A large quantity of bright red blood was passed through the urethra after the catheter came out. An attempt was made to wash the bladder free of clots and to control the hemorrhage by the reintroduction of the catheter. The hemoglobin at this time was 65 per cent. The patient was given opiates to relieve his pain and to produce quiet.

The following day the catheter drained bright red blood and the hemoglobin had dropped to 45 per cent. Because of the patient's age and his refusal of a second open operation, some method had to be devised to control hemorrhage without opening the bladder. Urethral catheters did not seem to cause sufficient pressure to stop the bleeding, several sizes being tried.

With a No. 18 French soft-rubber catheter and a rubber condom, an emergency instrument was constructed. A second eye was cut in the catheter about 1 inch from the end. The catheter was then introduced into the condom. The closed end of the condom was carefully tied around the closed end of the catheter at about the position of the usual eye. The other end of the condom was tied around the shaft of the catheter which made the condom a water-tight bag, the only exits being through the eyes of the catheter. When the condom was collapsed around the catheter it increased the caliber slightly. After thorough lubrication the instrument was introduced through the urethra and partially into the bladder. With a hand syringe water was injected through the catheter, which ballooned the condom. When dilatation was accomplished traction was made on the catheter so that the prostatic urethra was compressed and so that the catheter could not slip into the bladder.

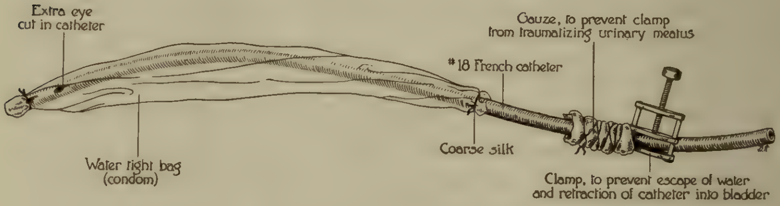
Extra eye cut in catheter
Gauze, to prevent clamp from traumatizing urinary meatus
#18 French catheter
Coarse silk
Water tight bag (condom)
Clamp, to prevent escape of water and retraction of catheter into bladder

Fig. 545.—Case V. Instrument to control hemorrhage following the punch operation.

This method proved very satisfactory to control hemorrhage in this particular case. The instrument was withdrawn every six to twelve hours to permit of catheterization. After thirty-six hours of compression in this manner the bleeding was entirely stopped.

This improvised bag has only been tried in one instance, but as there was severe bleeding which was stopped, I hope that this emergency method may assist others in controlling a similar complication.

The instrument can be improved if a two-way catheter is used, so that in addition to the distention to control hemorrhage, continuous drainage of the bladder is made possible. The traction should not be great, as the condom may burst. In this experience only slight traction was necessary to control the hemorrhage. The traction is made continuous by first tying a small sponge or piece of gauze around the catheter just outside the urethral meatus. Distal to the sponge is a small screw clamp, similar to that used with a proctocylsis outfit. This clamp prevents the water from coming out of the catheter and prevents the catheter from retracting into the bladder. The sponge is used to prevent the clamp from traumatizing the meatus.

CLINIC OF DR. JENNINGS C. LITZENBERG

UNIVERSITY OF MINNESOTA HOSPITAL

MYOMATA OF THE UTERUS AND PREGNANCY

Analysis of Cases and Discussion of the Question: When Shall We Operate Upon Women with Myomata of the Uterus Complicating Pregnancy?

THE case which we have before us today is a pregnant woman, near full term, with numerous myomata in her uterus. Her condition, not only calls for a consideration of the influence which these tumors have had on her in the past and may have in her approaching labor, but it also gives us the opportunity of discussing pelvic tumors complicating pregnancy. We will report for purpose of comparison other cases of tumors, myomata of the uterus, which we have seen during pregnancy, labor, and the puerperium.

Frequency of Myomata in Pregnancy.—There is a great difference of opinion as to the incidence of this condition, the figures varying from 0.7 to 42 per cent. This disconcerting disagreement is probably due to the fact that some consider only those tumors which really complicate the obstetric condition, and others include all cases with myomata, however small. Herbert R. Spencer says, "Fibroid tumors complicating pregmancy are quite common. It may be stated with approximation to accuracy that fibroids occur about once in 150 pregnancies." If all sizes of myomata are included my experience gives a higher ratio than this, and Munro Kerr states that if one include all cases the 42 per cent., quoted above, is not surprising.

When Do Myomata Interfere with Delivery?—Dystocia, or unusually severe pressure symptoms, seldom occur when the tumors are located in the upper segment of the uterus unless they are pedunculated and drop down into the pelvis, or grow to great size, when operation may be necessary.

Myomata located in the lower segment of the uterus or cervix may, mechanically, interfere with birth or cause malpositions. Tumors at the brim of the pelvis even when projecting considerably into the pelvic cavity are usually pulled up as the uterus grows, or, by retraction during labor, they rise enough to permit the child's head to pass. (See Case I, Fig. 546.) If ascent does not occur and manual pressure fail to disengage the head surgical interference will be necessary.

A myoma located in the pelvis on the posterior surface of the uterus causes more trouble than one of the same size on the anterior wall because the promontory of the sacrum interferes with its ascent. Pedunculated fibromyomata are uncertain factors. (See Cases V and VII.) Sometimes a long pedicle permits so much mobility that the tumor easily slips out of the way of the child; on the other hand (see Case V, Figs. 552–554), on account of the same facility of movement, it may drop low in the pelvis and may not be drawn up with the ascending uterus. Occasionally the tumor is not seen until it has grown so large that it becomes firmly imprisoned in the pelvis, resisting all efforts to dislodge it. In this location a myoma may cause grave pressure symptoms or an abortion, and in labor effectually block the passage of the child, necessitating a surgical operation.

Pedunculated tumors may also have a twisted pedicle which calls for surgical interference. The symptoms are almost identical with those of ovarian cyst with twisted pedicle (Case VII).

Effect of Pregnancy, Labor, and the Puerperium of Myomata. Increased Growth During Pregnancy.—Myomata in the pregnant uterus almost always increase in size, the rapidity and extent of growth depending on their location in the wall of the uterus. The interstitial variety, probably on account of rich blood-supply, grow most rapidly and to the greatest size. The submucous type often grow to considerable proportions, depending on the breadth of their attachment to the uterus (Cases II and III), likewise pedunculated tumors, while less likely to reach a very great size, may grow rapidly, especially if the pedicle is broad. Occasionally the blood-supply is so decreased that necrosis may occur in pedunculated tumors independent of any twisting of the pedicle. The enlargement is due to actual growth of the tumor elements and edema. Some authorities assert that edema is the larger factor, but in the few tumors I have enucleated tissue growth far exceeded the edema.

The myomata are so much softer than those found in the non-pregnant uterus that they are sometimes so mistaken for cysts.

Decrease in the Puerperium.—After delivery the tumors decrease rapidly. It is possible that they never disappear completely, but certainly they do become too small to feel. Lordine reported a case in which a myoma as large as the head of an eight months, fetus decreased to the size of a hazelnut in twenty-two days. (Case VIII is an illustration of marked decrease.) Munro Kerr says: "They occasionally do not decrease and sometimes even increase after delivery."

Change of Shape.—Changes in shape of the tumors are chiefly due to increase in size of nodules which at the time of physical examination were felt as only small elevations on the surface or even not palpated at all. The most remarkable change is the flattening out of the tumor so that it is not definitely demarked and appears as a marked thickening of the utering wall. Munro Kerr pictures this condition in an unusual case showing the flattened-out tumor extending from the brim of the pelvis to the fundus. Case IV (Fig. 551) also shows an example of this.

Impaction.—A myoma imprisoned in the pelvis may give no symptoms and slip up into the abdomen with nothing more than signs of discomfort (Case V, Figs. 552, 553); but if the tumor become thoroughly impacted the patient suffers unbearable pain, has nausea and vomiting, painful urination and sometimes difficult defecation, and the signs of threatened abortion (Case III, Fig. 549), bleeding and uterine contractions appear. In this event, if the tumor cannot be pushed out of the pelvis, immediate laparotomy is called for, the tumor being dealt with according to its size, location, and the period of gestation (Cases III and VII).

Degeneration in fibromyomata may call for surgical interference when tenderness and pain are excessive and uninfluenced by rest and sedatives. Enucleation is the operation of choice unless the degenerated tumor has become infected.

Infections occur in myomata in the non-pregnant and are more apt to supervene if the tumor is degenerated, and it is particularly to be feared in the puerperium, especially if the tumor has been injured during delivery. Symptoms of infection do not usually appear till two or three days postpartum. Hysterectomy will usually be the operation of choice, but if the infection be limited to a mass, which can be enucleated completely without contamination, we should hesitate to destroy the powers of reproduction.

Diagnosis of myoma is usually easy, but the diagnosis of pregnancy in the presence of fibroids is often very difficult. Many a surgeon has made the tragic mistake of removing a pregnant myomatous uterus. Submucous myomata may be mistaken for the child's head. In early pregnancy, when one finds two masses in the pelvis, it is often difficult to decide which is fundus and which is tumor.

Phantom Tumor of Pregnancy.—I have never encountered the so-called "phantom tumor of pregnancy," mentioned by Munro Kerr. It is described as an isolated contraction of a portion of the pregnant uterus. I wonder if this may not be a mistake in diagnosis due to a misinterpretation of the Braun von Fernwald sign of pregnancy—the one-sided softening of the uterus in early pregnancy, or to a failure to recognize the "Piscacek uterus"—pregnancy in one cornu. Time will usually clear up the diagnosis; so, unless there be a great emergency, delay is advised.

Treatment.—The treatment of myomata is determined not only by the size, location, type, and symptoms but also by the period of gestation, labor, and the puerperium.

Management in Pregnancy.—First of all I wish to emphasize the point that therapeutic abortion has no place in the management of pregnancy accompanied by myomata of the uterus. The modern development of surgical and obstetric knowledge and technic have entirely eliminated this procedure as unnecessary and unsafe. A great majority of cases will not require surgical interference during pregnancy unless the tumors seriously disturb the woman, endanger her general health, offer very probable or insuperable obstacles to successful delivery, or, finally, if they jeopardize her life. However, it is just these occasional dangers that demand our most careful consideration, for we want to know whether and when we should operate in pregnancy complicated by myomata of the uterus. In the interest of the child it is usually better to delay operation until after viability if circumstances will permit.

When the tumor is found in the pelvis in the early months of pregnancy try to push it out, employing the knee-chest or Sims' position if necessary. If this procedure fail, one may wait to see what nature may accomplish, but he must not delay till pressure symptoms cause the patient unbearable suffering or the enlarging tumor too seriously interferes with the functions of the bladder and rectum. Failure to release the tumor, especially if accompanied by severe pressure symptoms, calls for operation whatever the period of gestation. While it is generally advised to delay operation as long as possible in early pregnancy in the interest of the child, and because nature so frequently takes good care of the situation, some few cases demand operation on account of incarceration, size, pressure symptoms, or threatened abortion (Case III, Figs. 549, 550). Other occasional cases should be operated upon as a matter of judgment rather than of demand, because the size and location of the tumor and its rapid growth may make dangerous complications of labor so certain and interference with gestation so probable that it may seem wiser to operate early in pregnancy than to wait (Case II).

Choice of Operation.—Enucleation is the operation of choice early in pregnancy. (Cases II and III, Figs. 548–550.)

If hysterectomy is thought to be the likely choice, the operation should be postponed as long as possible (Case V) except in cases of emergency.

I shall not take time to discuss details of operating, but shall content myself with a few points in technic that should be carefully observed for the purpose of reducing the danger of abortion. The pedicle of a pedunculated tumor should be clamped as far from the uterus as possible except when the pedicle is very long (Case VII). The enucleation of subserous and interstitial fibroids must be done slowly and very gently. The incidence of abortion following this operation is only 15 per cent., but this figure can be still further reduced if meticulous care be taken to reduce the irritation of the uterus to the minimum. Myomata in the pregnant uterus, as a rule, shell out more easily than those in the non-pregnant, which may account, in part at least, for the small percentage of abortions following enucleation. Myomectomy should displace hysterectomy in early pregnancy unless the uterus is too much involved either by the size or the number of tumors. Even myomata deep in the uterine wall (Case III) may be removed without abortion sometimes even when the uterine cavity is accidentally opened.

Another thing that must be carefully observed is the method of introduction and tying of sutures and ligatures. Too large a bite or excessive tension may be factors in producing abortion. Care must be exercised, also, not to rupture the corpus luteum of pregnancy which may cause abortion independent of "manhandling" the uterus.

Too many operators give hysterectomy the preference over myomectomy on general principles, and also because the tumors, on account of their size, look more formidable than they really are and because myomectomy is supposed to be followed by a higher mortality. Wm. J. Mayo has refuted the idea that myomectomy is followed by a higher mortality than hysterectomy. Case III illustrates the possibility of successful enucleation of very large tumors from the pregnant uterus without abortion following. Too many hysterectomies are done in the early months of pregnancy and not enough attention given to preservation of the sacred function of motherhood.

Management in Labor.—Obstetric maneuvers through the vagina are of little avail when tumors block the passage; to attempt to drag a child past an obstructing tumor is a very grave error, even when it can be accomplished by forceps, version, or craniotomy. Injuries to the tumor inflicted by forcible delivery are far more dangerous than surgical procedures. If the tumor be in the pelvis an attempt to push it out should first be tried; failing this, one may, in favorable cases, await retraction, but if success does not follow, cesarean section must be done, followed by enucleation or hysterectomy, as the individual case may require. Tumors of the cervix can rarely be pushed out of the way and they cannot be expected, as a rule, to retract. Therefore in such cases they must be removed, preferably by the abdominal route, and by enucleation when possible, unless they are submucous and protruding from the cervical canal. Vaginal section is unwise except when the tumor is very small.

Choice of Operation.—The choice of operation will depend upon circumstances. Myomectomy or enucleation should be selected whenever the involvement is not too extensive or the tumors too numerous. The dangers of this operation have been overestimated. Either the enucleation or cesarean section may be done first. Following enucleation the child should be taken by cesarean section unless the os is dilated, when the child may be delivered by the vaginal route. When doing a cesarean section after enucleation it is wise to go into the uterine cavity through the myomectomy wound when it is favorably situated for such a procedure, but usually it will be considered wiser, especially if the uterus is greatly involved, to perform the cesarean section first, followed by enucleation or hysterectomy.

The mortality of cesarean section followed by hysterectomy is twice as high during labor as the same procedure during pregnancy, therefore one must be very sure that the operation will not be necessary if he allows labor to proceed. Subtotal removal should take precedence over total extirpartion unless infection be present or feared on account of previous improper handling. Cesarean section without myomectomy should not be thought of except when the condition of the patient renders it necessary to terminate the operation as quickly as possible.

Management in the Puerperium.—Surgical operation for removal of fibroids after delivery should be delayed until the woman has had sufficient time to recuperate from her parturition and until the myomata have completely involuted. Injury to the tumor followed by necrosis or infection may create an emergency requiring operation during the early puerperium.

CASES

Case I.—A secundigravida aged thirty-four. Menstruation began at age thirteen; always regular, but painful; interval twenty-eight days; duration three or four days and flow moderate till the age of twenty-five, when she noticed gradually increasing flow and the duration was lengthened to six days. For the last two years she has suffered from menorrhagia but no metrorrhagia, and her dysmenorrhea, which began at the age of sixteen, has increased. Last menstruation began January 21, 1922, due October 28, 1922. She was married when twenty-four, conceived first at twenty-eight years, and aborted when three months pregnant. The present is her second pregnancy, in which she has had some flowing for a week at the third month of gestation. She had some cramps and severe backache, but after a week in bed the flow and pain subsided and she has had no other complications. The patient noticed the irregularities in her abdomen, but thought they were fetal parts. She is now (October 20th) nearly at full term.

Examination.—Woman apparently at full term. Pelvic measurements 25–28–31–21–11.5. Numerous nodules are found on the uterus, the largest about 8 cm. in diameter, located on the right anterior surface of the uterus (Fig. 546) at the brim of the pelvis; others are scattered over the anteroir wall of uterus mostly above the umbilicus, one as large as a lemon just below the navel to the left of the midline, Presentation and position, O. L. A. The tumors found in this woman's uterus will, in all probability, not dangerously interfere with her safe delivery because myomata located in the upper segment of the uterus usually give no trouble unless they are very large. The largest tumor, while it is at the brim of the pelvis (Compare Fig. 546 with Fig. 555) and now in the way, will in all probability be pulled upward by the retraction of the uterus and permit the engagement of the head. Nearly all myomata of the lower segment, if they are not too large, eventually retract and the child is born spontaneously. Tumors considerably larger than this one will usually give no trouble other than possible delay even when located in the lower segment. It is my judgment that the most we need fear in this case is inefficient pains and prolonged labor, but dangerous uterine inertia is not the rule in these cases. We will, however, have to be unusually watchful in this case after delivery to prevent postpartum hemorrhage, which is a common complication.

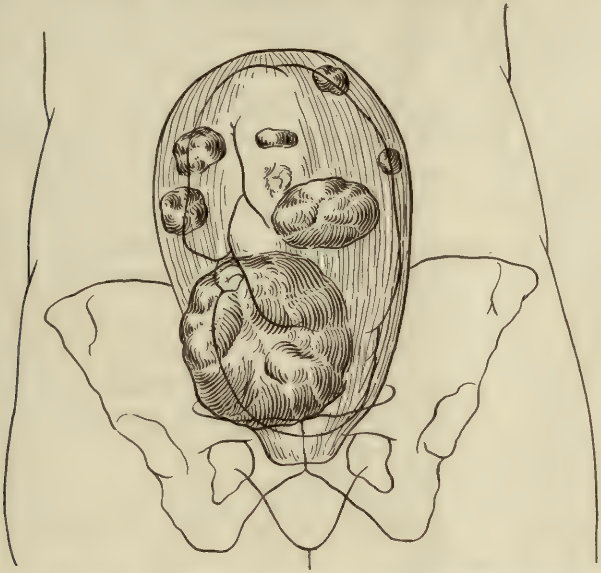

Fig. 546.—Case I. Showing relatively large myoma which, by retraction during labor, did not interfere with delivery. Compare Fig. 546 with Fig. 555.

There are other interesting features in the past history of this case which frequently accompany myomata of the uterus. We find that she had increasing dysmenorrhea, not uncommon in fibromyomata. Her increasing menstrual flow also is significant, finally taking the form of marked menorrhagia, and we also find from her history that she was sterile the first four years after marriage, and that in her first pregnancy she aborted at three months, and that she did not again conceive for six years, and finally she threatened to abort at the third month of this pregnancy; all of which occurrences not infrequently happen when the uterus is myomatous.

Note.—This woman was spontaneously delivered of a living baby boy one week later after a normal, though prolonged, labor of thirty-one hours. She did not have postpartum hemorrhage. This case is quite typical of the usual outcome.

While the incidence of fibroids complicating pregnancy is high, it is relatively seldom that real complications arise. Nature assisted by modern obstetric knowledge and skill so often successfully overcome the difficulties that a conservative attitude is taken by most obstetricians. Conservatism, however, does not here mean inaction. The real conservative is he who knows when to adopt radical measures as well as when to avoid them. There are a certain number of pregnant women with myomata of the uterus whose welfare, as well as that of their babies, will demand surgical operations.

It is to this class of cases, relatively rare, but in the aggregate amounting to a considerable number, that I wish especially to direct your attention.

The necessity for surgical interference does not depend upon the mere presence of the tumors, but upon their size, location, rate of growth, and symptoms, particularly those of pressure.

Case II.—Miss F., later Mrs. S.; aged twenty-eight. Menstruation began at age twelve, thirty-day type, amount of flow moderate. There were never any clots. The number of napkins were two or three a day.

First consulted me in February, 1919 for relief of backache, which she attributed to "female trouble." Two myomata were found in her uterus, one the size of a walnut located on left anterior surface of the uterus about the region of the internal os, the other, twice as large, was located on the posterior surface and to the right (Fig. 547). No other gynecologic conditions to account for the backache were found. Her backaches were due to double sacro-iliac strain, of which she was relieved by strapping. She was told of the presence of the myomata and advised that they had no relation to her complaint, and that as they were giving her no symptoms she need not worry about them. She was, however, instructed for the sake of safety to report for examination every six months or so in order that she might be assured that the tumors were not growing. She was informed that on account of their small size they would, probably, never give her any trouble unless she should marry and conceive, in which event she was instructed to be examined as early in her pregnancy as possible, because during conception the tumors might be expected to grow. Two years later, in December, 1920, at the age of thirty, she was married—now Mrs. S. She conceived in the first month of her marriage, and, remembering

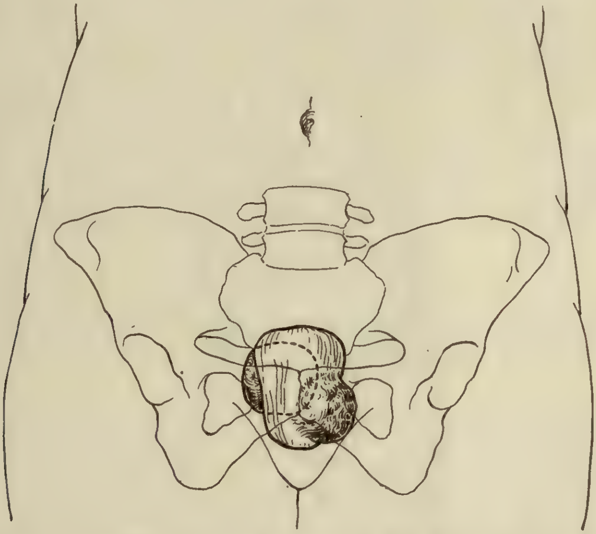

Fig. 547.—Case II. Showing myoma of the uterus found before pregnancy. Same uterus pregnant at three and a half months shown in Fig. 548. Broken line indicates portion of tumor on posterior surface of uterus.

my warning that the tumors might grow in case she became pregnant, she, very early in her pregnancy, sought the advice of a physician in a distant city, to which she had moved after marriage. He found that the tumors had increased considerably in size, and she was sent back to me for examination.

She consulted me on April 20, 1921. Her last menstruation, which was less than normal, was on January 1, 1921. She was therefore three and a half or four months pregnant, due October 8, 1921. She had complained of severe backache since April 13th, otherwise the course of the pregnancy up to this time had been normal. On physical examination the uterus was found to be pregnant approximately three and a half months. The two fibroids found in her uterus before her marriage had markedly increased in size. My history notes say, "The two small fibroids felt at a previous examination, February 1, 1919, one on the anterior surface to the left, and a larger one on the posterior surface to the right, have grown very markedly and together effectively block the pelvic canal." On account of the rapid growth, pressure symptoms, and location of the tumors an operation for an immediate removal of the fibroids was advised.

Operation.—Two days later, on April 26, 1921, laparotomy was performed for the removal of the tumors. On opening the abdomen a pregnant uterus of three and a half or four months, gestation, containing 4 myomata, was found. We had palpated only two masses before operation, the one posterior, which we diagnosed as the larger tumor, proved to be two fibroids very close together, which had given us the impression of one large irregular tumor, the two together after removal measuring 8 x 5½ cm. The anterior tumor, measuring 8 x 12 cm. after removal, was much larger than we had calculated because it was so deeply embedded in the uterine wall (Fig. 548). It was situated near the internal os and extended out into the left broad ligament. Another myoma, 3 x 1½ cm. after removal, which had not been recognized, was found just above the larger tumor. All were slowly and gently enucleated, deep bleeding was controlled by matress catgut sutures, great care being exercised not to tie them too tightly, and the raw surfaces were approximated with even more than usual care because we wished to avoid any undue tension which might cause abortion. The patient recovered without complications and was delivered normally at term after a ten-hour labor.

When one operates upon a pregnant woman with myomata of the uterus, particularly when he operates in the early months of pregnancy, he is called upon to defend his position because the condition so infrequently requires operation, and, if surgical procedures are used at all, many advise awaiting developments later in pregnancy or in labor. This woman was operated upon early because of the location, size, rapid growth of the tumors, and pressure symptoms.

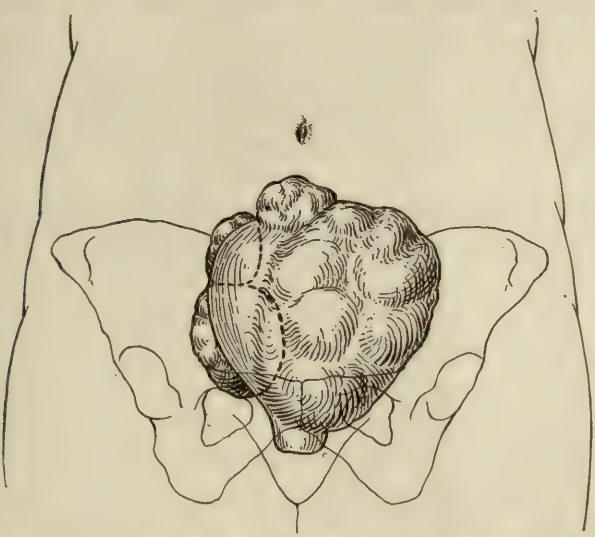

Fig. 548.—Case II. Showing the same uterus as pictured in Fig. 547, pregnant three and one-half months, tumors very greatly enlarged. Removed by enucleation, after which patient went to full term and was normally delivered. Dotted lines indicate the portion of the smaller tumors on the posterior surface. This figure also shows two myomata not palpable before pregnancy (see Fig. 547).

The location of the anterior tumor, well down in the lower segment, had already grown from the size of a walnut to from six to ten times that size. It was not only so low and so large, and still growing, that it alone would probably interfere seriously with delivery, but opposite to it on the posterior surface a little higher up was another tumor in such a position that we feared that the two would, as it were, act together in their interference. These considerations, together with probable much increased growth, led us to abandon our usual conservative attitude and decide to operate. We chose enucleation in preference to hysterectomy because we do not believe in removing the uterus early in pregnancy if it can possibly be avoided. To make a woman incapable of motherhood requires a decidedly positive indication. If we had believed hysterectomy indicated we would have awaited full term, when a cesarean section followed by hysterectomy would be the operation of choice.

Case III.—Mrs. L., aged forty-three, gravida I. Last menstruation February 21, 1921; therefore she was about three months and ten days pregnant.

This case was seen in consultation with Dr. Ivar Sivertson June 14, 1921. The cervix uteri pointed upward and forward behind the symphysis pubis. The enlarged soft pregnant uterus was incarcerated in the posterior pelvis firmly against the promontory of the sacrum. The mass in the pelvis had the soft, characteristic elastic feeling of a pregnant uterus. Efforts to dislodge the uterus from the pelvis were unavailing. A large irregular hard mass, felt extending from the symphysis pubis to 5 cm. above the umbilicus, was diagnosed as a fibroid. Other smaller tumors were palpated in the lower and upper segment of the uterus. On account of the inability to dislodge the pregnant uterus from the pelvis we were fearful that the great size of the tumor would prevent its rising, and there was great danger of causing an abortion. Her pelvic measurements were large, and we felt that there was no doubt she would deliver at full term if she could be relieved of the complicating tumor without aborting. We thought there was no chance of her going to full term on account of the imprisoned uterus, and particularly on account of the great size of the abdominal tumor. I think if you will look at the accompanying illustration (Fig.

549) you will agree with our conclusions that an abdominal operation was advisable.

On June 21, 1921 she was operated upon by Dr. Sivertson and the author. Much to our surprise we found that the pregnant uterus had come out of the pelvis and had rotated distinctly toward the left, but we still believed that on account of the size of the tumor an enucleation of the fibroid was indicated. The bladder was found to be very high, reaching half-way to the umbilicus, drawn up by the tumor. The origin of the large tumor was very broad, covering almost the entire anterior surface of the uterus. We discussed whether it were better to do a hysterectomy or an enucleation, but we finally decided in favor of the latter. A longitudinal incision was made over the fibroid mass, and with a small amount of cutting by the scissors we were able to enucleate the tumor. It had a very extensive and deep bed extending far down into the lower segment of the uterus. Ligation of the vessels was necessary and mattress-sutures were introduced and tied gently—sufficient only to control hemor-

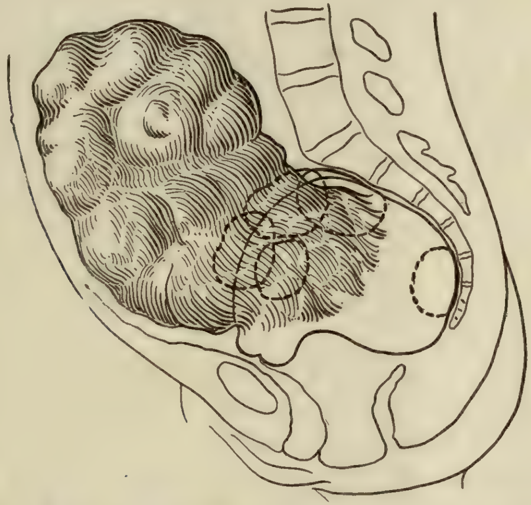

Fig. 549.—Case III. Showing retroverted pregnant uterus incarcerated in pelvis with large myoma extending 5 cm. above the umbilicus. Removed by enucleation. Broken lines indicate tumors behind the uterus hidden on account of abnormal rotation.

orhage. We were careful not to make the sutures tight. Too tight tying is one of the causes of abortion in enucleation of fibroids from the pregnant uterus.

In size the tumor was 7 inches long, 6 inches broad, and 5 inches thick, a very large tumor for a uterus a little more than three months pregnant. There were several smaller myomata; 2 in the lower and 3 in the upper uterine segment, all of which were removed. In all our manipulations we were particularly careful to avoid rupture of the corpus luteum pregnancy which was found in the right ovary, because this in itself may cause abortion. The patient left the table in good condition. As soon as she reached her bed morphin was given synergistically (Gwathmy), that is, $\frac{1}{8}$ grain morphin and 3 c.c. of 25 per cent. sterile, chemically pure magnesium sulphate. This was continued for a few doses to reduce the possibility of abortion. The patient had an uninterrupted recovery. There were no symptoms of threatened abortion at any time. She left the hospital in good condition.

I am indebted to Dr. Sivertson for the following postoperative and delivery notes:

"July 25th: One month after operation the patient's condition is very fine. Her only trouble is constipation.

"August 15th: Patient's condition is very good. Has felt fetal movements. The uterus is two finger breadths above the umbilicus.

"December 3, 1921: In labor. At 4 A. M., December 3, 1921, the membranes ruptured. She was delivered at 9.43 A. M. December 3d of a living baby girl weighing 9 pounds. Hemorrhage was moderate, although the uterus seemed to have a tendency to soften up. There is a feeling of hardness near the midline, which is probably the scar tissue of the uterine wound following the enucleation. Mother and baby left the delivery room in good condition. The delivery occurred on the two hundred and seventy-ninth day after the last menstruation. Her puerperium was normal."

The primary conditions leading to a decision to operate upon this woman were the incarceration of the pregnant uterus beneath the promontory of the sacrum and the excessively rapid growth leading to the great size of the tumor so early in pregnancy and the pressure symptoms. We were of the opinion that the weight of the large tumor was a factor in preventing the rise of the imprisoned uterus out of the pelvis, and on account of the retroflexion of the womb and the pressure symptoms complained of by the patient we feared an abortion, which would be a particular calamity in this case because she was an elderly primigravida forty-three years old. Furthermore, we felt that, even if the uterus should rise out of the pelvis, the tumor was a real menace both to her pregnancy and to her labor. We were mistaken in our conclusions that the incarcerated uterus could not be liberated, for we found the uterus above the brim (Fig. 550) of the pelvis at the operation; but we still had the very large myoma to deal with. After the abdomen was opened the decision between enucleation and hysterectomy was not an easy one, for the large tumor with the

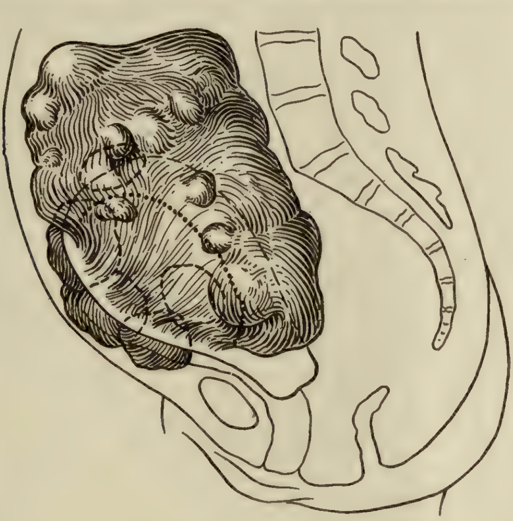

Fig. 550.—Case III. Showing same uterus as Fig. 549. Note distinct rotation of uterus and tumor to left following release from forces holding them in abnormal twisted position in the pelvis. Broken lines, parts of tumors on posterior surface, and dotted line shows area of attachment of the large tumor on the anterior wall.

five smaller ones made the task look rather formidable. However, we chose enucleation rather than to deliberately sacrifice the baby and abandon all future hope of offspring.

Case IV.—Mrs. B. This is one of those rare cases of flat interstitial fibromyoma of the uterus (Fig. 551). It was in the lower segment extending somewhat below the brim, preventing the head of the baby from entering the pelvis. She was first seen in labor after she had been having pains for many hours, and it seemed that the head could not possibly enter the superior strait. This case impressed me very profoundly because it was seen during my student days in Professor Schauta's Clinic. All of his assistants were of the opinion that the woman would not only be unable to spontaneously deliver, but that she could not even engage the head. While my advice was not asked I was very strongly of the opinion that the assistants were

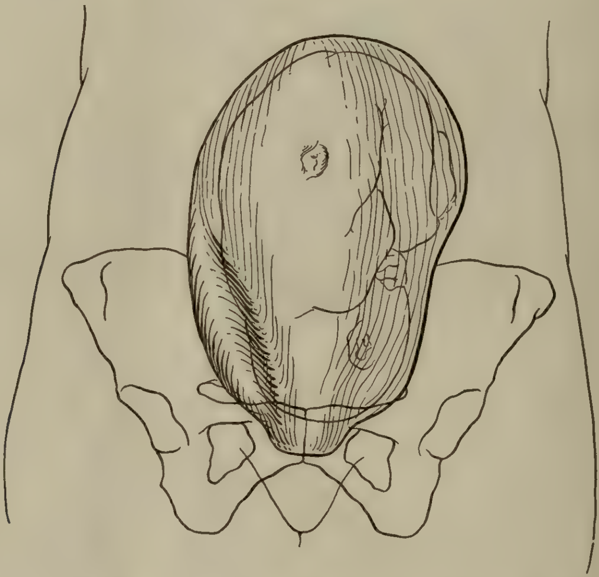

Fig. 551.—Case IV. Illustrating flattened interstitial myoma of the uterus which seemed would inevitably interfere with delivery. Tumor retracted during labor and the woman was delivered normally.

correct in their conclusion, and I was very much surprised when Professor Schauta, after examining the woman, said that she would deliver normally, which she did several hours later.

This case forcefully illustrates the fact that we must not be be in a hurry in forming conclusions that a baby cannot be born spontaneously because there is a tumor in the lower segment, for the powers of retraction of the uterus are so great that even tumors which seem impossible of ascent will be drawn upward and out of the way of the presenting part.

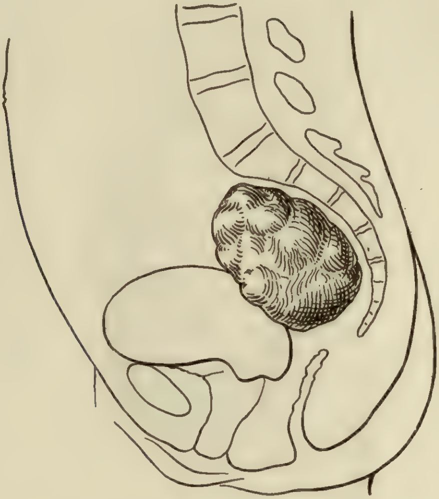

Fig. 552.—Case V. Showing myoma of uterus incarcerated in pelvis posterior to three months' pregnant uterus. This proved to be a pedunculated tumor found at different examinations in three different positions. (See Figs. 553, 554.)

Case V.—Mrs. A., aged twenty-three, primigravida. Presented herself for examination when three months pregnant. The uterus was anterior, easily diagnosed as a pregnancy, but was pressed markedly forward against the symphysis pubis and the abdominal wall. The vaginal examination revealed a hard mass (Fig. 552) behind the uterus fixed underneath the promontory of the sacrum. The tumor was about 6 by 10 cm. in size, very hard, immovable, and it seemed to me that if it continued to grow rapidly that even if it should ascend into the abdominal cavity or could be pushed up, that its size alone would materially interfere with delivery. I did not tell the patient of my fears, but informed her husband that the tumor would probably not make an operation necessary during pregnancy, as there was a chance of it ascending spontaneously or of being pushed up. He was told, however, that at the time of delivery we would probably perform a cesarean section. She was ordered to report frequently for examination, which she did. At the seventh month I was not very greatly surprised to find that the tumor had risen out of the pelvis, because I have seen this occur very unexpectedly in cases in which we thought such an event impossible; but I was very much astonished to find that the tumor, now, was not lying posterior to the womb, but anterior, and to the left, and now, that it was more accessible, it was found to be oblong and larger. It was not entirely out of

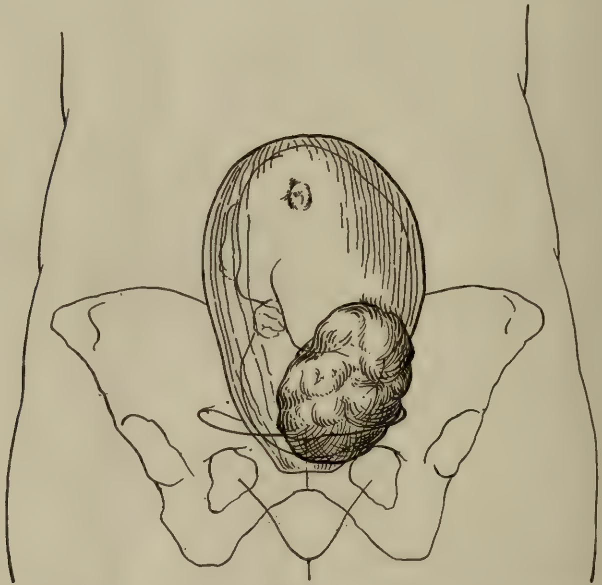

Fig. 553.—Case V. Same tumor as shown in Fig. 552 at the seventh month of pregnancy. Position of tumor now anterior to uterus.

the pelvis, the anterior pole being below the brim behind the symphysis, but the greater portion of the tumor was lying above the pelvic brim (Fig. 553). It was somewhat movable. I was still of the opinion that the tumor would probably interfere with delivery, but I did not feel quite so sure of my ground as I had at the previous examination on account of the location of the tumor and its moderate mobility. I thought it might be a pedunculated fibroid, with a short pedicle, which could be pushed out of the way during labor, but I still believed that we would need to do a laparotomy at the time of delivery.

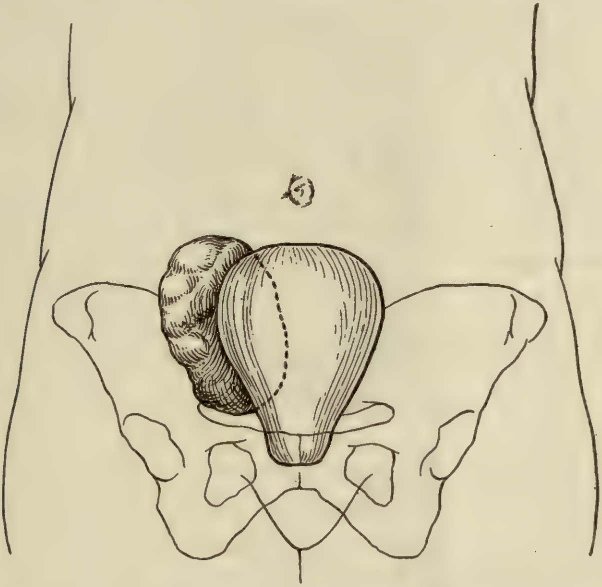

Fig. 554.—Case V. Same tumor as shown in Figs. 552, 553 now shown posterior to the uterus immediately after delivery. Tumor evidently had a long pedicle.

At seven months I found the same condition, but at eight months I was dumbfounded when I was unable to find the tumor at all. It could not be palpated anterior to the uterus, it was not in the pelvis, and therefore I concluded that it had slipped behind the uterus where it could not be definitely palpated. During pregnancy it is not uncommon to miss the diagnosis of an ovarian cyst, which may be hidden behind the uterus, but to be unable to find a tumor of this size which had previously been palapble was rather disconcerting. The head was now engaged, and, of course, I now knew that the baby could be born spontaneously, and informed the husband that the operation would not be necessary; and, to make a long story short, she was uneventfully delivered of a normal child.

Immediately postpartum the tumor was found, as I had anticipated, posterior to the uterus, but, to my surprise, on the right (Fig. 554) instead of on the left. Evidently this tumor was one with a long pedicle, because I found it in three different locations: first, behind the uterus in the pelvis; second, out of the pelvis in front of the uterus on the left side, and in the puerperium posterior to the uterus on the right side.

This woman has only recently been delivered. What our further procedure will be will depend upon the size of the tumor after involution is complete. My opinion is that at the proper time it will require surgical removal because although she came through this pregnancy without complication we may not be so fortunate the next time, and I fear there is danger of a twisted pedicle where there is so much mobility.

Case VI.—Mrs. R. Age twenty-three. She was seen first in beginning labor. She had several fibromyomata in the fundus of the uterus and one tumor of moderate size, about 4 inches in diameter, in the lower segment on the left anterior wall of the uterus palpable per vaginam, partially in the pelvis, and partially above the brim (Fig. 555), lying in a position which shortened the right oblique diameter of the pelvis. This is the type of tumor that in my judgment would in all probability ascend during labor with the retraction of the lower segment. This usually occurs with tumors in this location even when they are quite large, as in Case I (compare Fig. 555 with Fig. 546). In the absence of any other complication I should have advised that the woman be permitted to go on in labor and would have expected her to deliver, but she had a moderately generally contracted pelvis with the following measurements: between anterior superior spines 23 cm. between the crests of the ilium 25 cm., between the trochanters 29 cm., external conjugate 17 cm., and the diagonal conjugate, from the lower border of the symphysis to the promontory of the sacrum, 10 cm., giving us an estimated true conjugate, in this type of pelvis, of 8 cm.

We have here, then, also to consider the possibility of delivery in a borderline contracted pelvis in which the chances of spontaneous birth are moderately good. We know that in all degrees of contracted pelvis taken together about 80 per cent. deliver spontaneously, and that with a conjugata vera of 8 to $8\frac{1}{2}$ in the neighborhood of 40 per cent. will have normal births; and the percentage is very greatly increased if we add to this the cases that will be successfully delivered of a living child by forceps after engagement of the head. As far as the pelvis alone

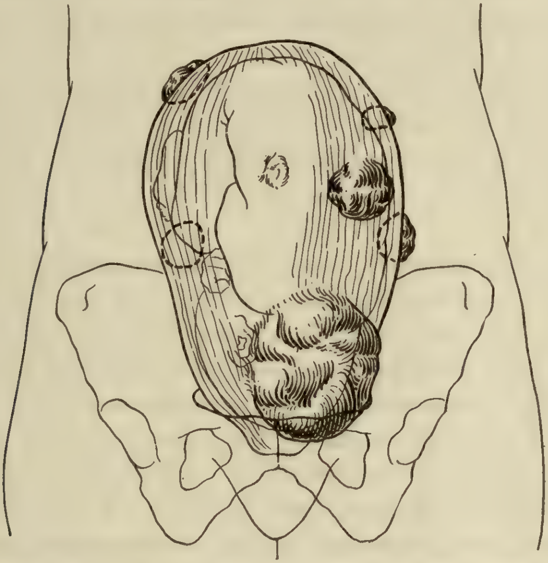

Fig. 555.—Case VI. Showing myoma at brim of pelvis which under usual circumstances probably would have retracted, permitting spontaneous delivery (compare with Fig. 546), but moderate contraction of the pelvis also being present, cesarean section was done, illustrating how two complications, neither one of which would alone be an indication for a cesarean section, but combined, furnished such an indication.

is concerned we would certainly have given her the "trial of labor" with reasonable expectation of a spontaneous delivery. We have here, then, two complications of pregnancy, neither one of which alone is a positive indication for surgical interference, but in our judgment the presence of the two complications together, the tumor and the borderline degree of contraction, justified the conclusion that operation was indicated. Therefore cesarean section was determined upon and successfully performed, resulting in a living baby and mother who recovered promptly.

There is room for a difference of opinion in this case, but we came to our conclusion on the grounds that the two questionable factors added together gave us a sum of possible difficulties which justified our course.

Case VII.—Mrs. K., aged thirty-two: nullipara. Married nearly ten years, never pregnant before. On physical examination the patient was found to be three months pregnant with a fibroid in the pelvis near the brim, and according to our judgment surgical interference was not indicated because we believed that the tumor would either ascend with the growth of the uterus, or would "retract" during labor. Three weeks after the examination, however, she was taken with a very acute severe pain, which was not like the characteristic pains of a threatened abortion, but similar to the symptoms of a twisted pedicle of an ovarian cyst. The patient lived near Minneapolis and was immediately transported to the hospital, placed in bed, and given sedatives. On physical examination we found that the tumor had risen out of the pelvis, that the uterus and tumor were painful, and the tumor particularly sensitive to pressure, and it was very freely moveable. We made a diagnosis of the fibromyoma with twisted pedicle. The abdomen was opened, and the twisted pedicle tied, incised, and covered with peritoneum. The patient made an uneventful recovery. She left the hospital at the end of two weeks, has had no further symptoms, and is now pregnant in her eighth month.

Pedunculated fibroids are not very uncommon, but twisted pedicle occurs less frequently than with ovarian cysts, probably because the pedicle is apt to be broader and the tissue of the pedicle firmer.

Case VIII.—Mrs. W. I was called to see this case three days postpartum; she had been delivered normally, but had developed a temperature which seemed to be accounted for by a respiratory infection. I was called to exclude the possibility of the temperature being due to a pelvic infection. In the course of the examination I discovered a myoma arising from the right wall of the uterus extending out to the pelvic brim. By abdominal palpation I estimated the size of the tumor to be about 5 inches long, 3 inches wide, and 2 inches thick. The great reduction in size of the myomatous tumors following delivery is well illustrated in this case.

Three years later I had occasion to operate on this woman for another pelvic condition. Before opening the abdomen, remembering that we had previously found a myoma in her uterus, we endeavored to locate the tumor by bimanual palpation, but were unable to do so. If we had not opened the abdomen we might have reported, as others have, that myomata sometimes disappear after delivery; but after the uterus was exposed we found that the tumor, which was 5 inches long before, was now very small, no larger than a hickory nut.

Case IX.—Mrs. G., aged twenty-seven; primigravida. Pregnancy normal except that several small myomata were found scattered over the body of the uterus. No large ones were detected. Position and presentation O. L. A. She had gone through a normal pregnancy, but engagement had been slow, and ill advised application of high forceps had resulted in the death of the baby before a consultant was called. Even after perforation of the head of the dead fetus and application of the cranioclast delivery of the shoulders was still impossible.

Seeking for the cause of interference a submucous fibroid about 5 cm. in diameter was found protruding from the uterine wall into the space between the fetal head and the anterior shoulder pressed firmly against the neck and preventing the passage of the shoulder (Fig. 556). After rotating the shoulders into the opposite—right oblique—diameter delivery was accomplished with no further difficulty.

The tumor was on the inner left lateral wall of the uterus and had evidently grown into its position as it and the baby developed together. A thorough examination during pregnancy or early in labor would, possibly, have revealed the presence of this tumor which by its peculiar location was bound to interfere with the descent of the shoulder, and the shoulder prevented the retraction of the tumor. Probably a cesarean section would have been the only means of getting a living baby.

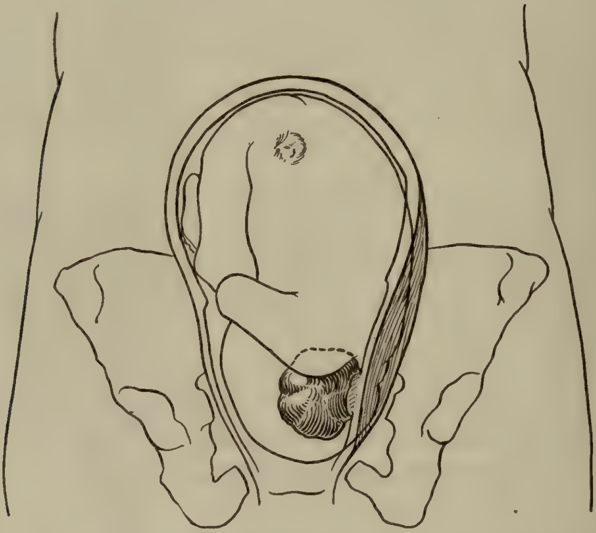

Fig. 556.—Case IX. Showing submucous myoma projecting into uterine cavity, but not interfering with the engagement of the head, but interfering with the delivery of the shoulder.

This tumor was in a very unusual location, and it would have been undoubtedly a very difficult thing to have made a diagnosis, but I think a trained obstetrician would have located the difficulty and have recognized the necessity of a cesarean section.

CONCLUSIONS

While myomata in the pregnant uterus are common, they seldom dangerously complicate pregnancy, labor, or the puerperium, and still less often require surgical interference. However, a few cases require operation on account of size, rapid growth, location in the lower segment, incarceration in the pelvis, pressure symptoms, threatened abortion, or when accompanied by contracted pelvis. To determine which exceptional cases should be operated demands acute obstetric and surgical judgment, therefore no operation for myomata of the pregnant uterus should be undertaken without the opinion of an experienced obstetrician.

CLINIC OF DR. WARREN A. DENNIS

MILLER HOSPITAL, ST. PAUL

CASE I. SUBACUTE PERFORATION OF GALL-BLADDER WITH INTRAPERITONEAL ABSCESS FORMATION

THIS patient is a woman thirty-nine years of age, the mother of 3 children, the youngest fifteen years of age. She had diphtheria seventeen years ago and was subject to tonsillitis until the tonsils were removed six years ago. Previous to the present illness she had had three severe attacks of abdominal pain, one two years ago, when she was confined to bed two weeks, one five months ago, and one seven weeks ago. Her physician says she had no fever with any of them. The pain commenced in the epigastrium and was very severe and continuous. It showed a tendency to radiate to both shoulder-blades, but eventually localized just above McBurney's point. The present attack commenced eight days ago with severe continuous pain in the epigastrium, radiating to both shoulders. The following day her physician was called and administered morphin. The next day it was still severe, but had moved to the right lower quadrant. Just above the area a mass the size of an orange developed in the next few days. A diagnosis of gall-stones had been made, but I felt some uncertainty because of the entire absence from the history of food idiosyncrasy or gas belching and because the greatest tenderness was located as low as the umbilicus. The persistency of the pain and the slight fever that now appeared, 100° F., were strongly suggestive of an acute empyema of the gall-bladder, but the tender area and mass (Fig. 557) were too low and there was a zone between this and the liver margin that was free from tenderness. The leukocyte count showed 19,550 with 89 per cent. of polymor-

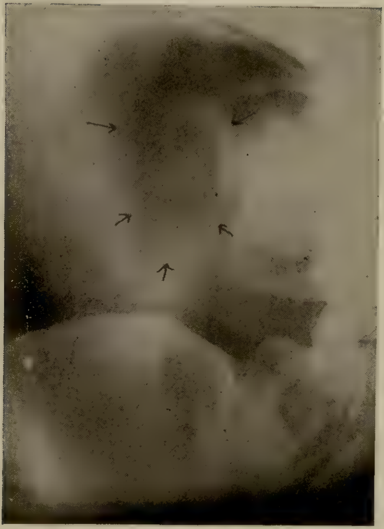

Fig. 557.—Case I. Shadow of intra-abdominal mass resulting from leakage from empyemic gall-bladder.

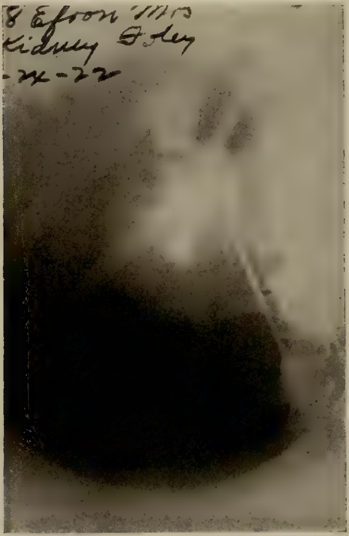

Fig. 558.—Case I. Right kidney and ureter; showing moderate hydronephrosis with displaced ureter, and demonstrating that the kidney is not responsible for the mass shown in Fig. 557.

phonuclears, and the finding of albumin, casts, and many red blood-cells in the urine aroused the suspicion that perhaps after all we had an infected kidney condition to deal with; this possibility seemed greater when a few days later, with the same urinary findings, there developed at the point of tenderness a tumor as large as a grape-fruit and evidently inflammatory. Cystoscopic examination showed no marked pathology in the bladder, clear urine from both sides, and a P. S. P. output within normal limits from each kidney. A pyelogram of the right kidney shows an early hydronephrosis and a ureter displaced nearly to the midline of the fifth lumbar vertebra (Fig. 558). I am unable to account for such a displacement except from a retroperitoneal cause.

Operation.—The incision is made through the right rectus muscle for the purpose of excluding an intraperitoneal condition, after which the approach is to be made through the loin. However, instead of opening the peritoneal cavity I open into an abscess cavity the walls of which are made up of agglutinated coils of bowel and the abdominal wall. The exploring finger comes upon a small smooth body which when recovered proves to be a cholesterin stone, and the diagnosis of the attending physician is confirmed.

Manifestly the gall-bladder has been the seat of an acute empyema. A limited perforation into the free cavity has followed, but nature has succeeded in walling off the escaped pus and stone. Hence, the low point of tenderness and of development of the tumor.

The factors in this case which to me made the correct diagnosis difficult were: first, absence of the characteristic food idiosyncrasy and gas belching which I expect to find in 90 to 95 per cent. of gall-stone cases; second, the low point of tenderness and tumor formation; third, the presence of many red blood-cells in the urine; these were associated with albumin, granular casts, and white cells in clumps, and doubtless were the expression of an acute toxic nephritis; but the unusual number of red cells appeared to contraindicate surgery till pyelography had excluded a kidney lesion; and, fourth, the displacement of the ureter seemed to point pretty definitely to a retroperitoneal cause. It still appears so and I am entirely unable to account for it.

Subsequent History.—The patient left the hospital thirteen days after operation and has been perfectly well ever since, except for a sinus at the point of drainage. Two and a half months afterward about a dozen more small stones were discharged.

Several weeks later after colicky pains several dozen more small stones escaped, but the sinus persists. Evidently the rupture in the gall-bladder persists and that organ is not yet free from stones.

As pointed out some years ago, acute empyema of the gall-bladder presents almost invariably a stone impacted at the entrance to the cystic duct, and I believe it is the impaction at this point that determines the empyema. The cystic artery approached the gall-bladder from above downward and outward and not parallel with nor in close relation with the cystic duct. For this reason a stone impacted in the duct causes no interference with the blood-supply of the gall-bladder, while one lying in the ampulla at the entrance to the duct makes pressure upon the wall at the point where the cystic artery enters it. The circulation is thus impaired and empyema readily results.

CASE II. SUBACUTE PERFORATION OF GALL-BLADDER WITH INTRAPERITONEAL ABSCESS FORMATION: PERNICIOUS ANEMIA

The pathology in Case I presents a feature so uncommon that it may be of interest to report briefly another case with an intraperitoneal abscess of like origin and almost identical features, but presenting, in addition, another entirely different pathologic entity.

This patient was a woman sixty-four years of age, the mother of 6 children. She had had two or three attacks of jaundice in the past five years, each lasting about a week, not accompanied by severe pain or causing confinement to bed. During the preceding three or four months she had noted a loss of appetite, belching of gas, and weakness; also occasional numbness of the hands. Examination disclosed a mass the size of a grape-fruit located beneath the right rectus muscle at the level of the umbilicus. It was rounded, smooth, fairly firm, and tender. It did not move with respiration. There was a non-sensitive zone between it and the liver margin. There was constant dull pain in the mass, and at times pain beneath the costal margin, not radiating to the back or shoulder; the skin showed no jaundice, but had a peculiar pale appearance. There was little loss of flesh. The urine showed a trace of albumin, but no casts. Her hemoglobin was 38 per cent., red count 1,490,000, white count 9450; with 86 per cent. of polymorphonuclears. The temperature ranged from 99.3° to 103.2° F., pulse from 90 to 110. The mass was evidently inflammatory and incision under gas resulted in the evacuation of 400 or 500 c.c. of rather thick pus. The walls of the abscess were made up of adherent coils of bowel and the abdominal wall. The free peritoneal cavity was not opened and no further evidence was obtained to indicate the origin of the infection, but the gall-bladder was suspected.

The subsequent history shows that drainage ceased in about a month, but three months later the patient was readmitted to the hospital complaining of the same pain beneath the right costal margin, slight swelling of the ankles, shortness of breath, and weakness. In contrast with these symptoms she had lost little in weight; the subcutaneous fat was well preserved. The skin presented a sallow, not jaundiced appearance. The tongue was pale and she complained of a constant bitter taste. The knee-jerks were absent. The suspicion was now aroused that perhaps we had also a pernicious anemia, and a reference to her previous blood findings lent weight to the suspicion, although her blood-picture now showed nothing that might not result from a severe secondary anemia: hemoglobin 36 per cent., red blood-count 2,830,000, white 1850, polymorphonuclears 46 per cent., lymphocytes 52 per cent., anisocytosis marked, poikilocytosis slight, an occasional normoblast. *x*-Ray disclosed a shadow which was apparently that of a single large stone in the gall-bladder. After transfusion with 500 c.c. of citrated blood the stone was removed under local anesthesia, but no definite improvement followed, and subsequent blood examinations pointed more and more strongly to a definite diagnosis of pernicious anemia.

She remained in the hospital two months, during which time she received three more transfusions, when the hemoblogin was 58, red count 2,690,000, white 4100 (P. M. N. 55 per cent., lymphocytes 45 per cent.), anisocytosis marked, poikilocytosis slight, nucleated reds none. The improvement proved quite transitory, and in spite of a fifth transfusion the patient has steadily lost ground and died of pernicious anemia.

In this case the pernicious anemia should probably have been recognized much sooner, but in the beginning was overshadowed by the unusual surgical condition, and later was thought possibly to be a severe anemia secondary to demonstrated old empyema of the gall-bladder, with the typical finding of stone impacted at the entrance to the cystic duct.

This case and the preceding one demonstrate the importance of pyelography in the diagnosis of obscure abdominal tumors.

CASE III. DERMOID CYST OF THE PANCREAS

This case presented originally a problem in diagnosis which has now resolved itself into one of treatment. The patient is a married man, forty years of age, who first presented himself for diagnosis and treatment over a year ago. His complaint was of "rheumatism" chiefly in the back and mostly on the right side. This trouble had commenced three years previously, and a simple appendix operation had been done about twenty years before. His appetite was good and the bowels regular, but he complained of gas rolling in the abdomen after meals and without dependence upon the character of the food eaten. There had been no loss of weight or failing in general health and he had been able to work regularly.

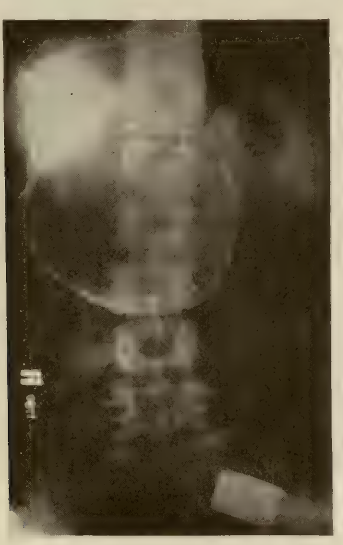

Fig. 559.—Case III. Cyst of pancreas; calcium deposit in walls.

Examination at once disclosed a mass (Fig. 559) about the size of a grape-fruit chiefly in right upper abdomen, but extending slightly to the left of the midline. It was firm, smooth and regular in outline, and slightly sensitive to pressure. It did not move with respiration and there appeared to be a slight interval between it and the liver dulness. There was nothing in the past history to throw any light on the nature of the tumor, and the urinary, blood, and other physical findings were negative. The diagnostic possibilities considered were tumor of the kidney, cyst (echinococcus) of the liver, and tumor of uncertain retroperitoneal origin. A pyelogram (Fig. 560) pretty definitely eliminated the first, and the fluoroscopic demonstration that the duodenum lay on the anterior surface of the tumor should probably have excluded the second, which was regarded as the most probable one in spite of this finding.

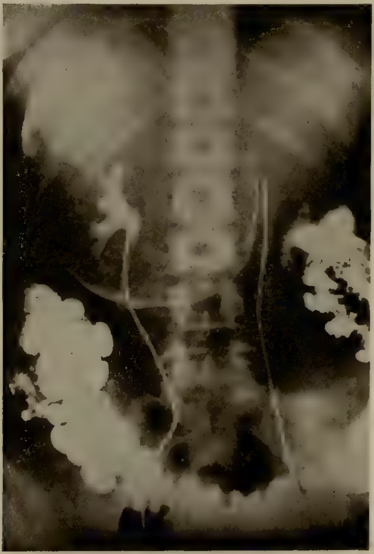

Fig. 560.—Case III. Cyst of pancreas; pyelogram eliminating kidney as possible cause of mass.

Incision from the ensiform cartilage downward and slightly to the right showed that the mass lay behind the posterior peritoneum. Exploration through the gastrohepatic omentum showed pancreatic tissue covering the surface of the tumor, as did also that through the gastrocolic omentum, and that made from the right side behind the duodenum, which was displaced forward. The conclusion was inescapable that the tumor originated in the pancreas itself. Because of the intimate relations of important structures to the mass, which was now felt pretty certainly to be cystic, removal appeared too hazardous to be undertaken. The gastroduodenal vessels lay on its surface, the abdominal aorta and inferior vena cava were behind, the portal vein behind, and the common duct on the right. Marsupialization was accordingly done and the cyst opened, the incision traversing about $\frac{1}{2}$ cm. of pancreatic tissue before the firm and rather fibrous cyst wall was exposed. The contents disclosed the grumous, greasy material characteristic of dermoid cysts, as well as a few short hairs. There was a considerable amount of calcareous deposit in the lining.

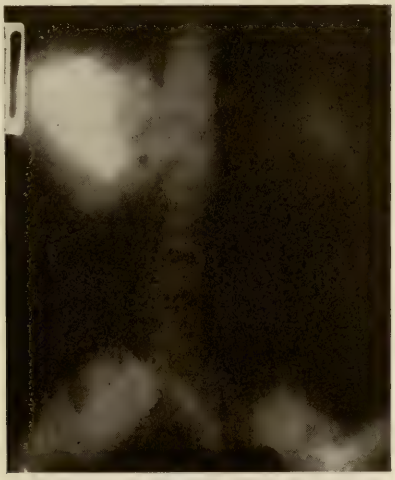

Fig. 561.—Case III. Cyst of pancreas.

Dermoid cyst of the pancreas is apparently very rare. The only other case I have been able to find is that reported by Judd, in which the cyst occurred in the tail and was removed *in situ* without opening. Because of the nature of their lining dermoid cysts yield notoriously unsatisfactory results following simple drainage. Had the real character of this one been known it would perhaps have been wiser to accept the additional risk involved in extirpation without opening, though this would certainly have been great. The cavity still drains. Zenker's fluid was first employed, and later radium, in an attempt to produce necrosis in its lining membrane. Neither produced appreciable results, though the radium was introduced once only because of fear of effects beyond the cyst wall, as well as the obvious inability to affect all parts equally. Multiple strength Dakin's solution, after the plan employed with such success by Gatch in old empyema cavities, is now being tried. A profuse watery discharge persists, though the man is in excellent general health and works daily. The accompanying *x*-rays (Figs. 561, 562) show the reduction in the size of the cavity.

CASE IV. FIBROMA OF OVARY; FIBROMA OF LABIUM MAJUS

This case presents two points of interest. The patient is an unmarried woman thirty-five years of age. She is large and strongly built and weighs 230 pounds. She comes complaining of swelling of the left leg, which has been present continuously for the past six months. For a week there has been some discoloration of the skin like that seen in varicose veins. There had been slight swelling in both feet, disappearing overnight, before the advent of the persistent edema in the left leg. Except for this trouble she says she is in perfect health save that five days before menstruation she has pain in the left lumbar region which is entirely relieved by the application of hot towels and evacuation of the bowels following a dose of citrate of magnesia. The flow itself is painless and normal in amount.

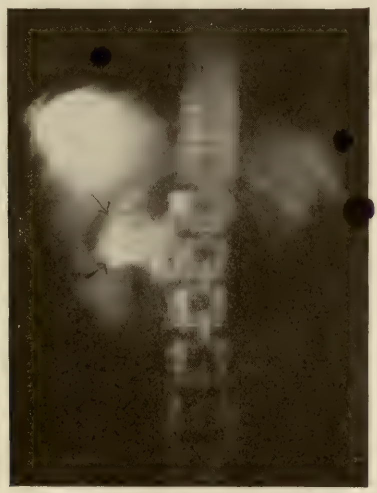

Fig. 562.—Case IV. Cavity remaining after thirteen months of drainage (injection with sodium bromid solution).

Examination shows marked swelling of the left limb and slight swelling of the right. The veins are somewhat varicosed on both sides. Palpation reveals an abdominal tumor, rounded, hard and smooth, and extending from the pubis to a point on the right side 3 cm. above the navel. On the left it reaches a level 2 or 3 cm. below the navel and there is a sulcus between the two portions. On vaginal examination a hard smooth mass is felt projecting downward behind the symphysis, but the cervix cannot be reached. A diagnosis of fibromyoma of the uterus is made.

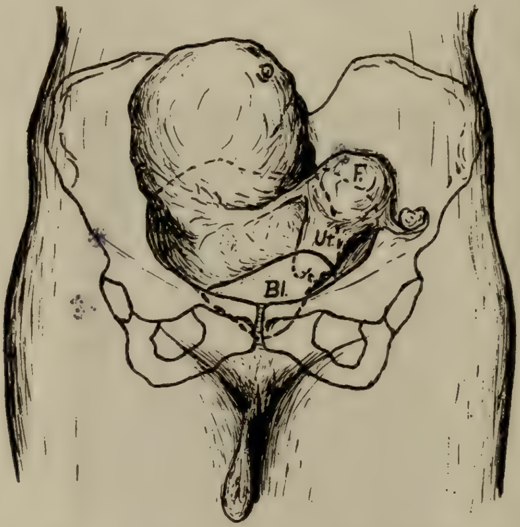

Fig. 563.—Case IV. Sketch of very large fibroma of right ovary completely filling pelvis and dissecting up posterior peritoneum to a point 2 to 3 cm. above the umbilicus.

From the right labium a slender pendulous mass hangs for a distance of 15 cm. Its extremity is pear shaped and 2 cm. in diameter, and its stalk is $\frac{1}{2}$ cm. in diameter. Normal skin covers the proximal half, while the surface of the distal portion presents a fibrous appearance. The whole tumor swells somewhat during menstruation. It is painless, but annoying because of its location. This secondary finding of fibro-(lipoma?) of the labium is of some interest.

On opening the abdomen it is found that the mass on the left is the uterus containing a number of small fibroids, and pushed upward entirely outside the true pelvis. The main mass instead of arising from the uterus, as had been supposed, apparently takes its origin from the right ovary, of which no vestige can be recognized. The right tube traverses the surface of the lower portion of the tumor, which separates widely the leaves of the broad ligament on the right side and elevates the left out of the true pelvis. This space is so completely filled by the tumor that the fingers are introduced with difficulty between it and the pelvic wall on either side. On the right side the tumor has elevated the posterior parietal peritoneum to a level 2 to 3 cm. above the umbilicus.

Dislocation of the mass out of the true pelvis is impossible, and myomectomy offers the means of removal. This is followed by hysterectomy. Convalescence without incident.

CLINIC OF DR. A. R. COLVIN

City and County Hospital, St. Paul

SOME DISABILITIES OF THE KNEE-JOINT

The knee-joint presents an unusual number of interesting conditions which, possessing certain symptoms common to all of them, makes diagnosis at times difficult or impossible. The grouping of some of these conditions under the caption Internal Derangements seems to imply an interlocking of clinical phenomena.

"Circumscribed injuries of the interior of the knee-joint," which has been suggested as a substitute expression for this grouping, is also useful as an aid to the clinical approach.

Perhaps a combination of the two, "circumscribed injuries of the interior of the knee-joint leading to internal derangement," would broaden our conception as to the number of the conditions and at the same time emphasize the character of the symptomatology. Catching and locking of the joint always suggests to the clinician the probable nature of the condition. A number of comparatively recent experiences has demonstrated the necessity for keeping in mind the various possibilities during clinical investigation and later operative approach.

Repeated catching of the joint is common to many diseases and injuries, while actual locking is confined to a limited number. Intermittent locking always suggests a recurring displacement of a semilunar cartilage. Permanent locking may result from other causes.

The sudden appearance of this phenomenon after slight trauma led, in a recent case, to a diagnosis of injured semilunar cartilage until a radiograph disclosed a loose body in the joint. A man of fifty-five was sawing a board, when he experienced sudden pain in his knee and the joint at once became locked and remained so for three weeks. The radiograph showed not only the loose body, but a defect in the mesial condyle of the femur in the location, characteristic of osteochondritis dissecans (Fig. 564). On opening the joint the bone fragment, which had suddenly become extruded from the articular surface of the femur, was found to be attached to some strands of the posterior crucial ligament which held it anchored in such a position that extension of the joint was impossible. The patient assured me that he had had no symptoms referable to his joint preceding the sudden pain and locking.

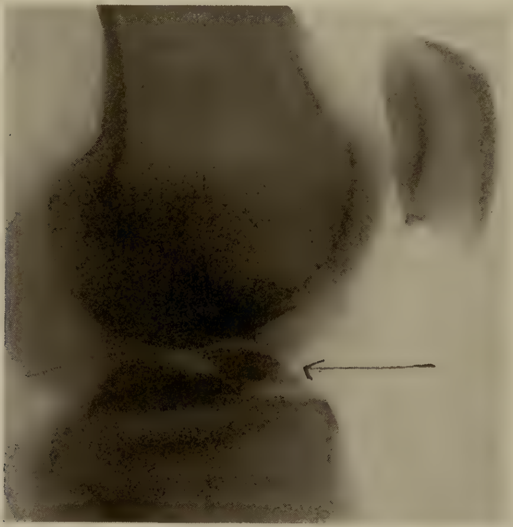

Fig. 564.—Loose body due to osteochondritis dissecans causing "locking" of joint for three weeks.

Osteochondritis dissecans, besides being responsible for a large number of loose bodies in joints, with their attendant symptomatology, is productive of clinical manifestations prior to the extrusion of the dissected loose fragment.

The pathogenesis of osteochondritis dissecans it may be stated is, up to this time, not settled. The name given by König in 1887 is descriptive of a dissecting process which gradually brings about the separation of an osteocartilagenous body which appears in the joint as a loose body (joint mouse).

To the clinical acumen and pathologic knowledge of König we owe what we know of the obscure and interesting process, and while not much has been added to his observations, the x-rays have enabled us to follow more clearly and consecutively its cause. Pain may be the only symptom complained of for several years; during this period there may be neither functional disturbance nor objective evidence of trouble. Following the variable period there may be one of intermittent "catchings" of the joint which may or may not be accompanied by joint swelling. In Fig. 565 is shown at *A* a small body in a well-defined oval area in the mesial condyle of the femur. This patient complained of intermittent joint catchings and pain for a number of years before the condition in Fig. 565 was seen. Figure 566 is a radiograph taken six months later and shows at *A* the fragment which has been extruded from the location as shown at *A* in Fig. 566.

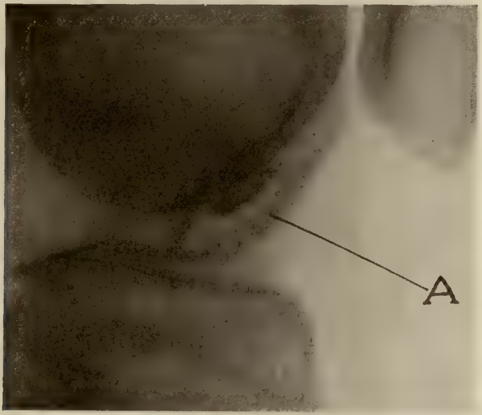

Fig. 565.—Osteochondritis dissecans, dissected bone still *in situ.*

The catching complained of might very well be confused with the catchings of a torn but not displaced semilunar cartilage.

Osteochondritis dissecans has been said to occur usually in young people; it so happens that 3 cases under my observations have been in men over fifty. Figures 565 and 566 are of a man fifty-one years of age. Figures 567 and 568 are of the knee-joint of a girl sixteen years of age. In this case four years of pain without other objective or subjective evidence of trouble

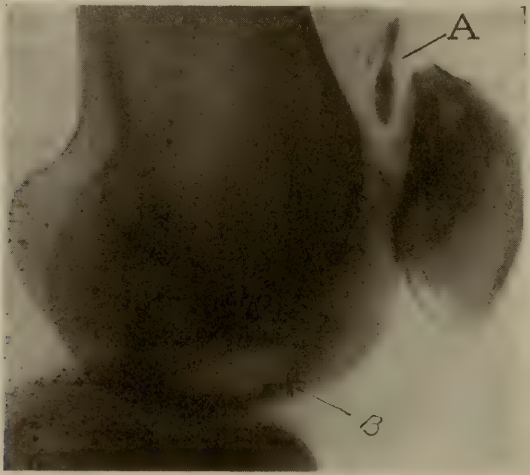

Fig. 566.—Showing at *A* the loose body and at *B* the cavity from which it was extruded.

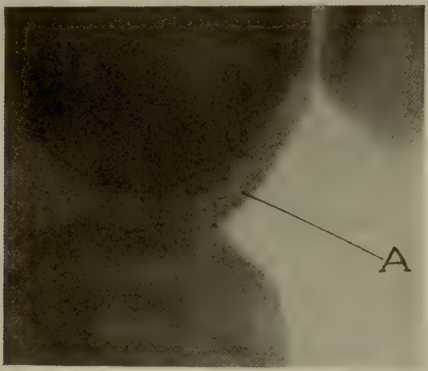

Fig. 567.—Osteochondritis dissecans dissected body at *A*.

preceded the loosening of the dissected piece of bone. After this period movement of the joint became painful, and in a short time the symptoms characteristic of a loose body appeared, and at operation the fragment was found free in the joint.

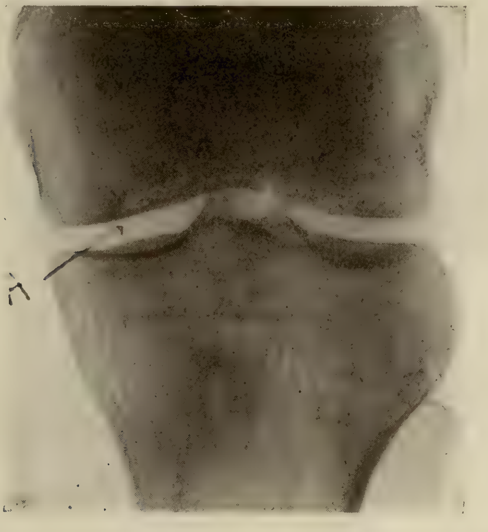

Fig. 568.—Osteochondritis dissecans dissected body at *A*

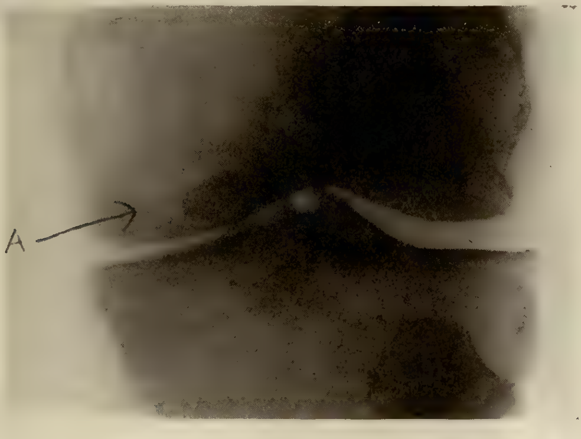

Fig. 569.—Osteochondritis dissecans dissected body at *A*.

Figure 569 is of the knee-joint of a man sixty-five years of age who complained of pain for several years and then began to have some catchings of the joint. The fragment shown at *A* was removed at operation. Figures 570 and 571 are of the knee-joint of a male eighteen years of age, who complained of painful and swollen knee. For six years he suffered from "rheumatism" in this knee, that is, he had more or less constant pain until one

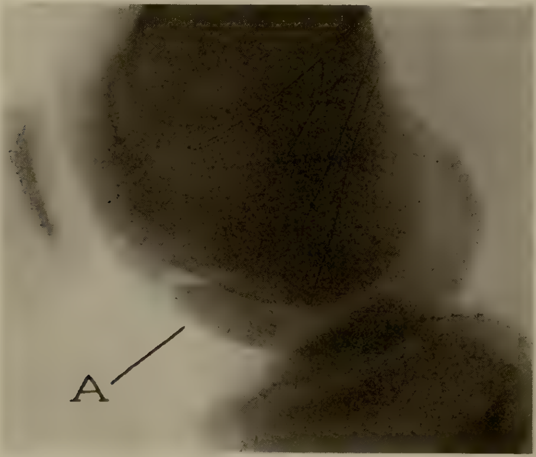

Fig. 570.—Osteochondritis dissecans dissected body at *A*.

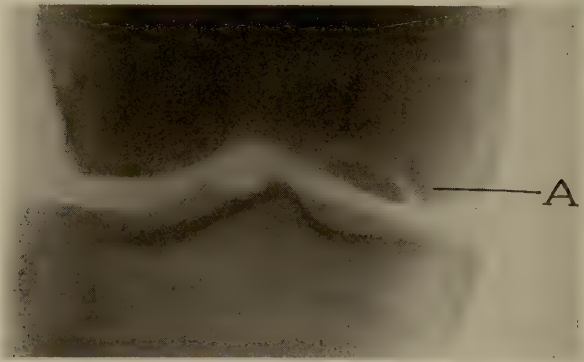

Fig. 571.—Osteochondritis dissecans dissected body at *A*.

year ago, when he experienced an unusual amount of pain, his knee became swollen, and movement painful. These acute symptoms subsided more or less and for a year he suffered only from pain again. The present condition began in the same manner as the attack a year previously; he now has uniform swelling of the joint with considerable restriction of movement. Radiographs disclosed the conditions seen in Figs. 570 and 571. Experience gained from the former 2 cases seemed to indicate that because of the change in the symptoms from pain only to swelling and disturbance of function, the dissected bone was becoming more detached. Six years of symptoms and the probability of an indefinite period of disability in the future made one advise operation, although believing that the dissected piece of bone had not become extruded from its bed. On opening the joint there was found a moderate amount of ropy straw-colored fluid, the synovial membrane was much reddened. An area of the joint cartilage corresponding in size to the piece of bone and cartilage shown in Fig. 573 was seen to be of a yellowish-white color and was lacking in lustre; at one part of the circumference of this area a small fissure was noticeable in the cartilage and one now noticed that the entire area was very slightly bulging. Pressure on this raised surface gave one the impression that it was depressible as if resting on a cushion-like bed. An

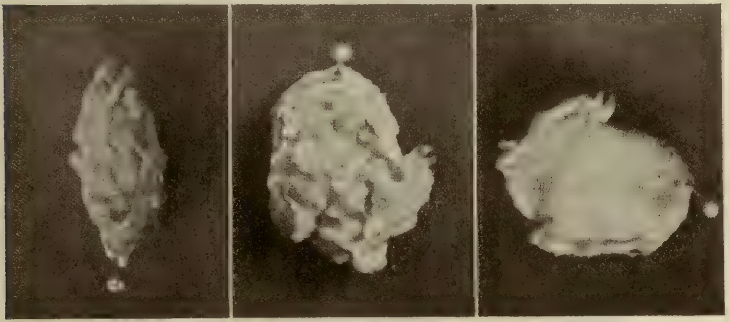

Fig. 572.—The osteocartilaginous body shown in Figs. 570 and 571 after removal.

incision was now made in the cartilage on the circumference of the raised area and the piece of bone and cartilage as seen in Fig. 572 was pried from its bed; in removing it one was conscious of the fact that it still remained somewhat loosely attached at its base. The surface of the bed from which it was removed was indurated, covered here and there with granulation tissue, and at the center of the cavity bled quite freely. The removed fragment was thus doubly convex, covered with joint cartilage on one surface and with an irregular layer of fibrocartilage on the opposite or superior surface.

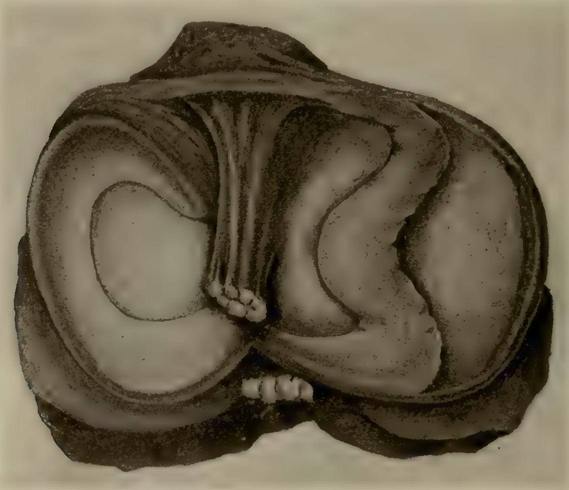

Fig. 573.—Semilunar cartilate torn from coronary attachment except at two extremities causing "locking" of joint for three weeks.

The cause of the disturbance of function including the "catchings" which were noticed during the dissecting period and before the fragment was extruded into the joint could be explained by the findings at operation in this last case. On removing this piece of bone with its cartilage the bed from which it was removed was covered with granulation tissue and the surface of the removed bone which fitted into this bed was covered with a layer of fibrocartilage. This increase of tissue seemed to cause a bulging of the fragment toward the joint cavity, and this no doubt caused a painful pressure at times, which felt like a catch of the joint.

The final separation of these fragments seems to be brought about by a fracture of the cartilage. In none of the cases operated upon had any disease of the cartilage been found, the process would be more accurately described as a dissecting ostitis. When the bone fragment has been dissected from the parent bone and is made to bulge into the joint, fracture of the cartilage and a loose body results.

The symptomatology of osteochondritis dissecans may thus extend over a number of years. In all of the cases referred to except one where no symptoms were noticed until a sudden locking of the joint occurred pain was the only symptom for several years, pain of an aching character and referred to the knee-joint; after a variable period of pain the function of the joint becomes impaired, with swelling and limitation of movement more or less persistent or in attacks of varying severity, these attacks at first are not accompanied by characteristic catching or locking of the joint, they resemble more the clinical picture seen in villous arthritis or so-called "fringe joints," or in the earlier stages of arthritis deformans. Finally the symptoms present the characteristic picture of a loose body.

Pain alone, then, is a characteristic phenomenon, there is perhaps no other diseased condition of the joints or of the bone in the immediate vicinity of the joint (for after all this condition is primarily an ostitis) that exists for the same length of time without causing any disturbance of joint function.

A diagnosis of this dissecting process having been established by radiographic study, and the symptoms being of such severity that relief is demanded, operative removal of the fragment is justified. This is most readily accomplished by a mesial parapatellar incision. Through this incision the articular surface of the condyle is clearly exposed to view; either a fissure in the cartilage, a bulging area, or a slight discoloration of the cartilage will disclose the diseased area, and after incising the periphery of this area at any point the fragment is easily pried out to its bed.

It is quite evident that osteochondritis dissecans at all stages of its progress may easily be confused with numerous diseases and injuries of the knee-joint.

Perhaps the most common one is injuries of the semilunar cartilage, which can be of the most diverse nature and consequently present a very variable symptomatology. While the typical story of injury with locking of the joint followed by sudden release and subsequent recurrences of these phenomena seems to point positively to a lesion of the semilunars, one may very easily be deceived. Compare, for instance, the story and symptoms of the first case cited in this paper and illustrated in Fig. 564 with the following:

A man of thirty after a comparatively slight trauma was unable to extend his knee-joint and this locking continued for three weeks. On opening his joint the mesial semilunar cartilage was found torn from its coronary attachment except at its two extremities. As a result of this it projected into the joint in such a manner that the free edge of the cartilage became sharply convex toward the center of the joint (Fig. 573) and this effectively prevented extension of the joint. Only after detaching the two extremities was it possible to release the small projecting loop. The story and symptoms in the 2 cases are almost identical.

In contrast to this lesion of a semilunar was that of a young man who following an injury had repeated attacks of painful catching of his knee-joint. A small round movable body could be felt on the mesial side of the joint; arthrotomy revealed the internal semilunar torn from the anterior half of its coronary attachment. The anterior loose extremity had become formed into a rounded bulbous mass about the size of a pea (Fig. 574); this was the body which could be palpated and which never led to locking of the joint. In a review of the subject of injured semilunars in the Ergebnisse der Chirurgie und Orthopädie for 1914 illustrations from an article by Krois are shown in which are illustrated 22 different lesions of the semilunar cartilages. The symptoms are consequently of the most varied nature.

Jones tells us that after an experience of 500 arthrotomies he is quite prepared in cases even with classical symptoms to find his diagnosis wrong. Quite recently an athletic young man gave a history of two severe injuries of his knee-joint and subsequently had numerous catchings of the joint. While a diagnosis of injured semilunar seemed positive, the symptoms were irregular enough to warrant reservation. Arthrotomy revealed normal semilunars and a fatty fringe almost 1½ inches long, having its origin from the infrapatellar fat pad (Fig. 575). While cognizant of the fact that these fringe-like bodies represent frequently the second products of arthritis due to various causes, still removal of the fringe in this case has resulted in the cure of the joint disability.

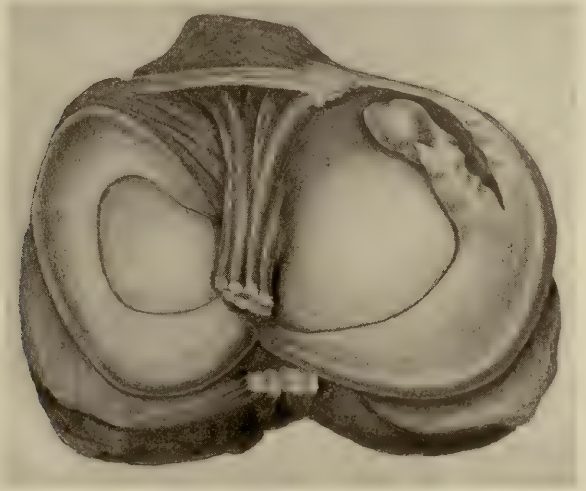

Fig. 574.—Semilunar cartilage loose at anterior attachment with bulbous extremity causing only "catchings."

So that repeated traumatic arthritis (sprain or distorsion) may lead to an inflammatory condition of the normal fatty fringes of the joint. In this case the long-drawn-out fatty fringe-like process was quite abnormally long.

Where clinical evidence is not sufficient to warrant an exact diagnosis and the radiograph does not reveal any pathology, exploration of the joint may be demanded. Unless a wide range of possibilities is kept in mind one may easily fail even by this means to clear up the mystery. A narrow escape from failure was experienced in the following case:

A young man presented himself with a history of trauma followed by several years of catching of the joint resulting in marked effusion, pain, and disability. The radiograph did not reveal any pathology; on exploration a reddened synovial membrane with a good deal of straw-colored fluid was found. Another finding which in the light of added experience seems of value in explorations was the presence of minute particles of cartilage in the synovial fluid, and of minute implants of cartilage on the synovial membrane. When these are found they are suggestive of an injury to the hyaline articular cartilage. I have found this condition in joints the subject of a loose body due to osteochondritis dissecans.

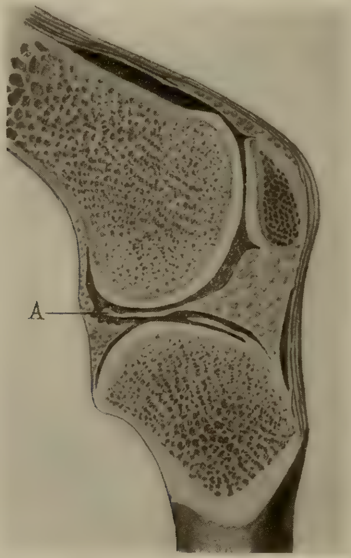

Fig. 575.—Fringe-like process extending from infrapatellar fat pad causing "catching" of joint.

In the case now being discussed the semilunar cartilages were normal and nothing abnormal could be seen except the items quoted above. Rather extensive digital exploration did not discover anything, and finally, by bimanual exploration, one hand pressing from the outside, an indefinite sense of contact of something movable was made with the examining finger in the joint. Continued pressure with the outside hand made it possible finally to demonstrate and remove a piece of cartilage about the size of a thumb nail which conformed in contour and thickness to the articular cartilage of the condyle of the femur (Fig. 576).

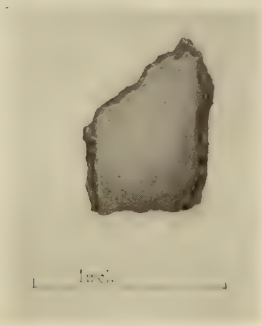

Fig. 576.—Loose piece of hyaline cartilage from articular surface of femur causing "catching" of joint.

Inasmuch as a loose body of this character is not seen in the radiograph, and as preoperative diagnosis may be impossible, thorough digital exploration of the joint may be necessary, even if one does it reluctantly.

INFECTED FRACTURE OF THE BASE OF THE SKULL

It is difficult to state with accuracy the percentage of recoveries in fractures of the base of the skull. Many of them, of course, are of such gravity that death ensues very quickly. The remainder, however, that are still seriously injured furnish a large proportion of recoveries.

The extent of the fracture in cases that recover cannot, of course, be accurately determined.

Rawlings cites a case of fracture of the base in a boy of fifteen, who when first seen was collapsed and pulseless and bleeding from both ears, the nose and mouth, both tympanic membranes were lacerated; facial paralysis on one side developed. One pupil widely dilated and one contracted to a pin point; marked internal strabismus of one eye. The boy made a rapid recovery. He speaks of this as the typical basal fracture, *i. e.*, passing from one auditory meatus to the other, involving both middle ears and the spenoidal sinus in the middle line; the line of fracture passing just in front of the genu of one facial nerve, thence forward to the sphenoidal fissure and across the dorsum sellæ.

The following case, while evidently following closely the lines of fracture described by Rawlings, was even more extensive and being complicated by infection, recovery under these circumstances being rather remarkable.

A boy of sixteen was brought to the City and County Hospital July 17th in a semiconscious condition. During the examination a short time after his admission he became very irritable. He was bleeding from both ears and from his nose and there was a paresis of the left facial muscles. He regained consciousness several hours after his admission, and on July 9th said he was all right. His temperature, which rose to 100½° F. the evening of his admission, fell to normal the next morning, remaining so until July 21st, when there was a gradual rise, reaching 104° F. on the 22d, falling then to 99½° F., reaching 100½° F. on the 23d, becoming normal on the 24th, to rise again to 104° F. on the 25th. On the 20th he complained of pain in his left eye. A note was made at this time that his pupils were unequal, the left being the larger. From this time on he complained of headache. Pus was found running from his left ear and marked tenderness was elicited over the mastoid process. On July 26th the usual incision for dealing with mastoid suppuration was made; this exposed a fracture running horizontally across the mastoid process; the mastoid cells contained pus, as did the antrum. After the ordinary complete mastoid procedure attention was again directed to the fracture, and it was found that this followed closely the groove for the lateral sinus in the bone. Clotted blood was found between the sinus and the bone. The fact that ordinary uncomplicated mastoid suppuration is not usually attended by as high a temperature as we had in this case (104° F.) made one suspicious of further trouble. Although the temperature was high, the patient was mentally clear, except that he seemed a little dull on account of pain. The sinus appeared normal and although sinus phlebitis could not be excluded, it seemed best before considering the advisability of exploring the sinus to investigate the further course of the fracture as far as accessible.

Extending the incision at right angles to the mastoid incision the fracture was traced posteriorly to the midline behind. The suspected infection of the line of fracture was, however, not found. Because of the facial paresis it was suspected that the fracture involved the region of the aqueductus fallopii, and if so, that it probably involved also the posterior surface of the petrous portion; still suspecting an infection of the line of fracture, it was decided to gain access to the extradural space on the posterior surface of the petrous portion. To do this an opening through the bone was made internal to and above the sigmoid sinus and external to the internal auditory meatus, and pus between the dura and the bone liberated.

After the operation the temperature returned slowly to normal, occasionally rising to $100\frac{1}{2}$° F. as late as August 16th. Except for this his convalesence was undisturbed, the discharge from the middle ear also ceasing.

The fact that he was on admission bleeding from both ears and from his nose would make it seem probable that the fracture extended from the middle line behind (where it was exposed during the operation) across the base of the skull to the right petrous portion.

The routes of infection from the middle ear and mastoid are pretty well established. Extradural pus is usually found over the tegmen of the tympanum or antrum or in the sigmoid groove in the usual mastoid infections. In fractures of the base complicated by rupture of the tympanic membrane infection from the tympanic cavity and mastoid cells would follow the same route. Another less common situation for pus is that described in the operative report of this case. Here, however, the route of infection was that of the fracture. The fracture line continuing from this point backward, was not infected, but in all probability it would very soon have become so.

There is room for differences of opinion as to when mastoiditis occurring in the course of ordinary middle-ear suppuration should be operated upon and as to whether certain cases may not recover without surgical interferences, but in basal fractures complicated by middle-ear suppuration with the added avenue of fracture for infection of the interior of the skull, doubt should be dispelled by exploration as soon as symptoms pointing to probable infection of the bone supervenes.

There is no more satisfactory operation in surgery than that for mastoid suppuration. The successful surgery of the complications, extradural abscess and sinus thrombosis, are comparatively common. The symptoms of these complications would not differ in infected fractures from the same complications occurring in ordinary mastoid suppuration, and should be as satisfactorily dealt with.

Von Bergmann reports 2 cases of infected fracture of the base, both successfully dealt with, one two weeks, the other twenty-one days after the injury. In one he opened an extradural abscess through the tegmen of the antrum, in the other he merely drained the mastoid process; both recovered.

Although purulent leptomeningitis would be most likely to occur early from fractures complicated by an escape of cerebrospinal fluid; occurring later, it may arise from a pre-existing extradural abscess, and, as we have seen, these in the mastoid region can be successfully dealt with.

Whether in basal fractures an extradural abscess over the cribiform plate of the ethmoid due to infection from the nasal cavities could be diagnosed early enough to be successfully evacuated is problematic.

Von Bergmann reports an autopsy where death occurred two weeks after the fracture from meningitis due to the Diplococcus pneumoniæ. Extradural pus was found in this region.

Although the following case does not come under the category of basal fractures as usually spoken of, it possesses some points of interest relative to infections at the base of the skull.

A woman aged forty was admitted to the City and County Hospital March 24, 1915 for gunshot wound of the head. The bullet, 32 caliber, had entered the left nares, leaving only some powder marks and a slight laceration of the tip of the nose. She complained of pain in the head and face and in the back of the neck. Her temperature, which was subnormal on admission, was normal the next day and remained so for five days; during these five days she complained very little of pain. On the sixth day the temperature rose to 103° F. and she suffered a great deal of pain in the head, the temperature remaining at 103° F. On the seventh day operative interference was decided upon. The radiograph of the head (Fig. 577) showed the bullet at the level of the superior border of the petrous portion of the temporal bone as well as the general course taken by the bullet as indicated by lead particles. From this information it seemed as if the bullet could only have entered the cranial cavity through the great wing of the sphenoid; on the interior of the skull the space included between the sphenoidal fissure above the anterior branch of the middle meningeal artery laterally, the carotid artery mesially, and the foramen spinosum and oval behind was most likely the area of entrance.

This area could be reached only from an opening in the temporoparietal region above the zygoma. An osteoplastic flap was made and the dura separated from the bone to the base; here some loose bone fragments were felt and removed. An opening in the dura could also be made out, and with a hook-shaped director inserted through this opening the dura was incised as near the base as possible, the finger inserted down to the tip of the temporosphenoidal lobe, and an abscess in this lobe opened; the bullet could not be felt; drainage was inserted to the region of the abscess.

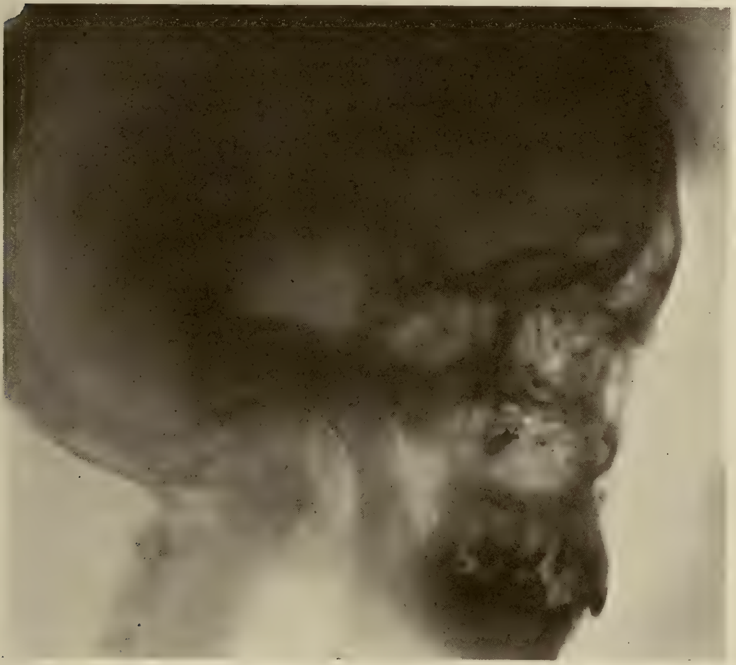

Fig. 577.

The patient made an uninterrupted recovery, the temperature reaching normal on the third day after the operation and remaining normal thereafter. She left the hospital on the eighteenth day after the operation and has remained well for the ensuing eight years except that she had a cholecystectomy performed one year after the head injury.

She now suffers neither pain nor any inconvenience from the bullet, which remains in the same region where the radiograph showed it at the time of the injury.

CLINIC OF DR. WALLACE H. COLE

Miller Hospital Clinic, St. Paul

ASTRAGALECTOMY AND BACKWARD DISPLACEMENT OF THE FOOT FOR TALIPES CALCANEUS DUE TO INFANTILE PARALYSIS. OPERATION AND DEMONSTRATION OF CASES SHOWING AFTER-TREATMENT AND RESULTS

Case I.—This first case is a girl fifteen years old who gives a history of infantile paralysis when two years of age. The residual paralysis was confined to the left leg and foot, and although the patient has always had difficulty in walking, no treatment has ever been undertaken. The examination on admission to the hospital showed a typical talipes calcaneus deformity of the foot and only the heel touched the floor when the patient walked (Figs. 578, 579). The muscles of the thigh were all acting strongly, as were also the peroneal muscles, and, to a lesser extent, the extensor longus digitorum. The other muscles of the leg and foot were paralyzed. There seemed to be little doubt that astragalectomy was the treatment of choice, and this operation will now be performed. When Whitman first devised this procedure it was recommended for cases of calcaneus only, but since that time it has gradually widened its scope until at the present time the operation is also recognized for its usefulness in the treatment of flail feet, and the varus and valgus deformities where the paralysis is too wide-spread to allow tendon transplantation. Joint and tendon fixation, although useful in certain cases of paralysis, should never be used in calcaneus, as the results obtained are in no way comparable to what we may expect from astragalectomy.

The operation will be performed with a tourniquet applied to the mid-thigh. In order to get rid of as much congestion in the limb as possible it is elevated to the vertical position for a few minutes, and then the first turn of the tourniquet is applied quickly in order to shut off the arterial supply at practically the same instant as the venous return. If the compression is applied slowly the superficial veins are shut off first and the blood keeps flowing into the leg until the moment when the artery is finally closed. A congestion of the leg distal to the tourniquet thus results, and an annoying venous bleeding could be expected

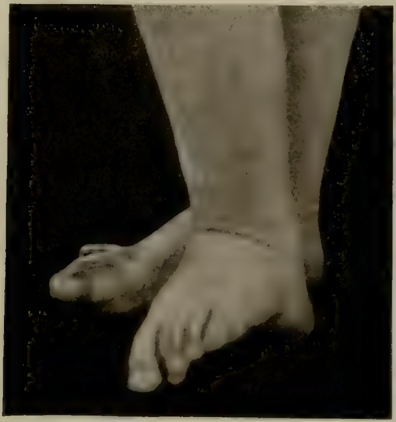

Fig. 578.—Paralytic calcaneus before operation. Lateral view

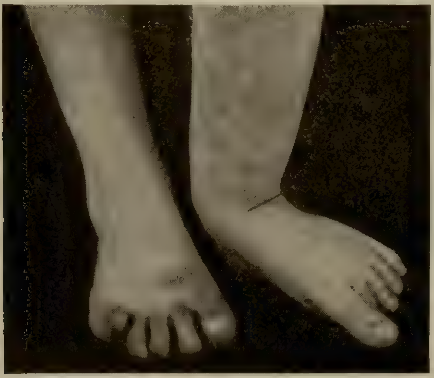

Fig. 579.—Paralytic calcaneus before operation. Anterior view.

during the first part of the operation. The skin of the leg and foot is prepared by the usual iodin method, and a small gauze sponge is folded over the toes as an additional safeguard. This is held in place by an ordinary heavy rubber band.

The incision runs from a point half-way between the tendo achillis and the lateral malleolus and about 1 inch above the level of the tip of the latter, down around the malleolus, and forward on the dorsum of the foot to the head of the astragalus. The peroneal tendons are picked up and divided well forward and freed to the upper angle of the wound. The tendo achillis is now exposed and a slit cut in it near its base through which the freed ends of the peroneal tendons are passed. An artery forceps will keep them from slipping out again (Fig. 580). I

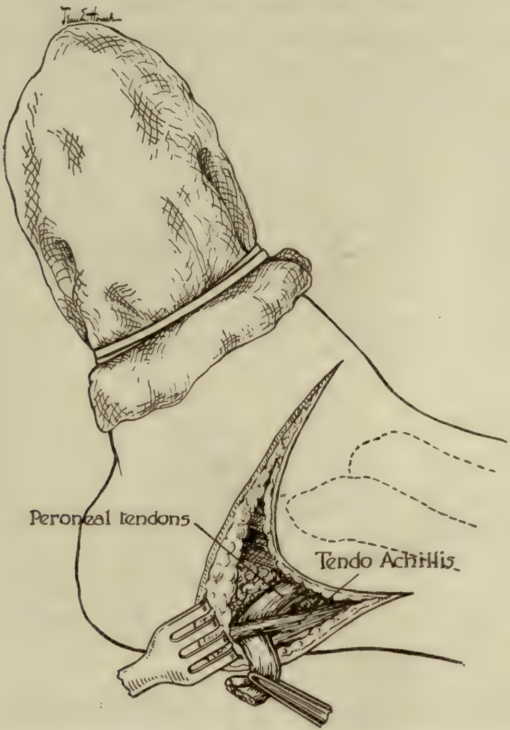

Fig. 580.—Peroneal tendons passed through Achilles' tendon in first stage of astragalectomy.

have found it easier and quicker to do this part of the tendon transplantation at this time rather than at the later time usually recommended. The lateral and interosseous ligaments are now cut and the head of the astragalus is freed as much as possible. The foot can now be forcibly inverted until the sole is pointing toward the body, and the astragalus is easily removed by cutting the attachments on the medial side. Both malleoli are freed from all ligamentous structures and the posterior lip and surface of the lower end of the tibia also cleared by passing an osteotome up back of them (Fig. 581). If this part of the operation is not completely performed it will be impossible to obtain the desired amount of posterior dislocation of the foot which we will want in a few minutes. Pockets are now prepared for the freed malleoli on either side of the tarsus. On the medial side we free the soft tissues from the scaphoid with a sharp Ollier raspatory, and on the lateral side a thin layer of bone is cut from the adjoining surfaces of the os calcis and the cuboid.

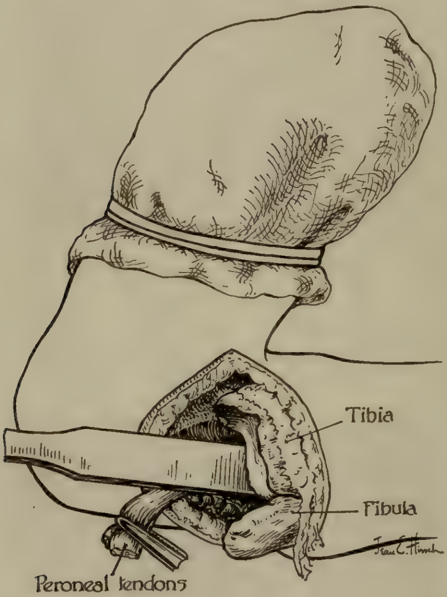

Fig. 581.—Freeing of lower end of tibia and fibula in astragalectomy.

The inner surfaces of the malleoli are reshaped with a thin, sharp osteotome so that they will fit well into the pockets prepared when the foot is dislocated backward. The lateral malleolus is very thick in this case and we will, therefore, remove a portion of its outer surface. The foot is now dislocated and the malleoli fitted into the pockets, and in order to hold them there and prevent the dislocation from being reduced during the closing of the wound and the application of the plaster, a mattress-suture of heavy chromic catgut is inserted, uniting the flap removed from the cuboid and the os calcis with the structures on the outer side of the lateral malleolus. The peroneal tendons are then drawn taut and fastened to the Achilles tendon with a series of interrupted chromic catgut sutures. The deep and superficial tissues are closed with plain catgut and a subcuticular stitch of No. 00 chromic catgut closes the skin. No gauze dressing is placed over the wound, but the foot and leg are wrapped with several layers of sterile sheet wadding and then a plaster-of-Paris dressing is applied extending from the toes to the mid-thigh, with the foot in the position of slight plantar flexion and abduction and the knee at a right angle. The plaster being all applied, we now remove the tourniquet. This leg will be suspended over the bed from a frame in order to prevent congestion and make recovery from the operation less painful.

Case II.—This patient was operated upon one week ago and had an astragalectomy performed in the same way as the case just finished. She is being shown in order to demonstrate the first stage in the after-treatment following such an operation. The leg in the postoperative plaster is suspended by bandages from a simple overhead frame, and you will notice that there is no swelling or congestion of the toes and that the child can move around in bed without discomfort (Fig. 582).

Case III.—This next girl shows us what the first step in the ambulatory after-treatment of astragalectomy consists of. At the end of three weeks from the time of operation the overhead slings are dispensed with and the plaster dressing removed. At this time it is my custom to take a lateral *x*-ray of the foot to check up on the dislocation, and the film of this case shows, as you can see, a good displacement (Fig. 583). A model of the foot is taken immediately, and then a walking plaster with a heavy, wedge-shaped sole applied and the patient encouraged to walk. This child was operated upon about four weeks ago and has only just had the walking plaster put on (Figs. 584, 585).

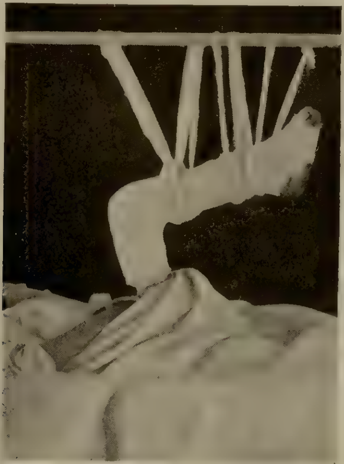

Fig. 582.—Postoperative fixation of astragalectomy.

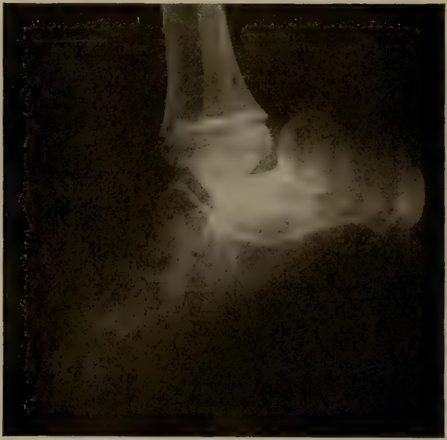

Fig. 583.—*x*-Ray of foot following astragalectomy.

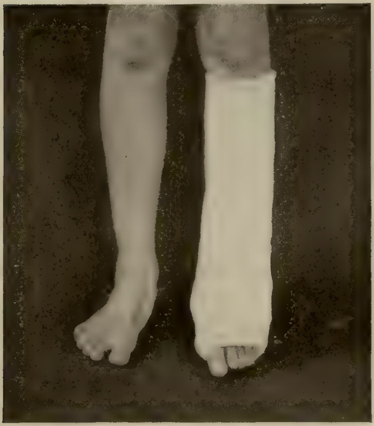

Fig. 584.—Walking plaster used after astragalectomy. Anterior view.

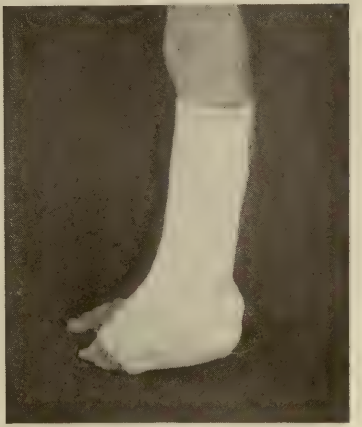

Fig. 585.—Walking plaster used after astragalectomy. Lateral view.

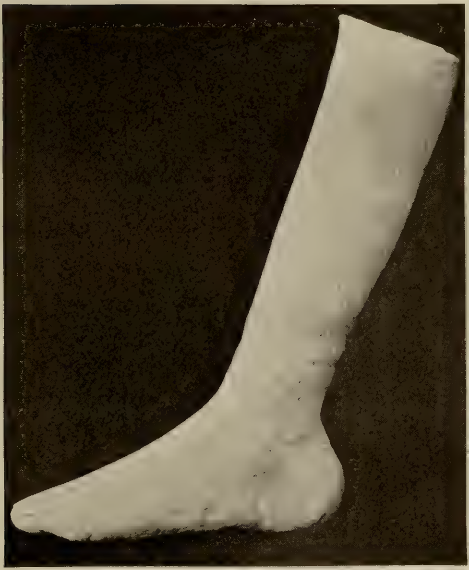

Fig. 586.—Model of foot over which leather anklet is made following astragalectomy. Lateral view.

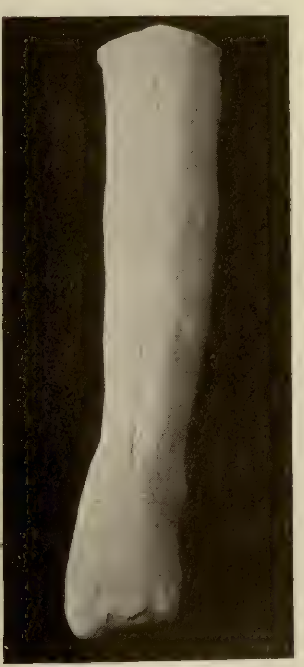

Fig. 587.—Model of foot over which leather anklet is made following astragalectomy. Anterior view.

The plaster model over which the walking brace will be made shows you the appearance of the foot when the plaster was changed (Figs. 586, 587).

Case IV.—An astragalectomy was performed on this patient three months ago, and we can see not only the result of the operation but also the brace which has been worn for the last month. You will notice how stable the foot is and how the weight, bearing line is all that we can desire (Figs. 588–590).

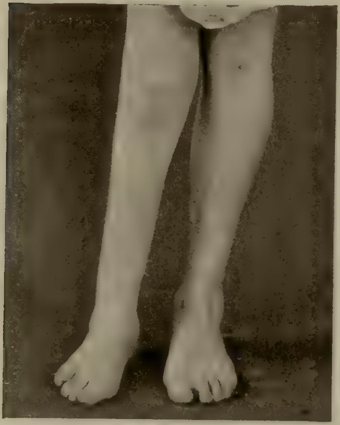

Fig. 588.—Postoperative astragalectomy for calcaneus. Anterior view.

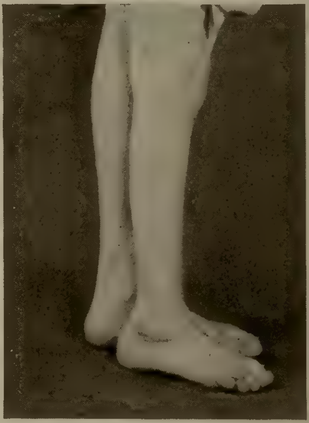

Fig. 589.—Postoperative astragalectomy for calcaneus. Lateral view.

The brace which we use is a molded leather anklet with an inverted Y-shaped steel running down the back and on to either side. A wedge of cork is incorporated in the brace under the heel to keep the foot in the proper position and to make up partly for the shortening (Figs. 591, 592). Usually, on account of the atrophy of the paralyzed foot, the shoe will fit over the brace without much trouble, although the upper part may have to be remodeled in order to fit neatly. Such a brace is worn for from six to nine months, and then, if stability has been obtained, a cork left in the shoe under the heel is all that is needed, and this only to make up for the shortening.

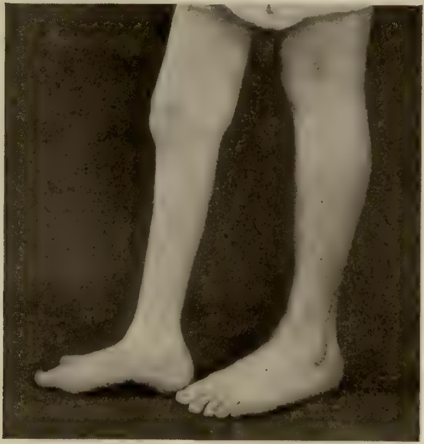

Fig. 590.—Postoperative astragalectomy for calcaneus. Medial view.

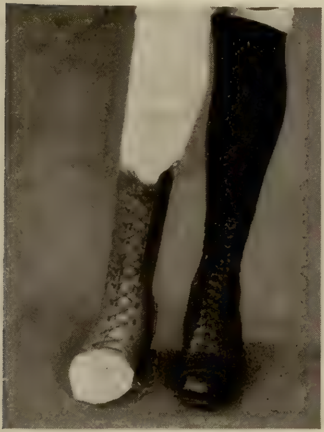

Fig. 591.—Patient wearing the leather anklet after astragalectomy. Anterior view.

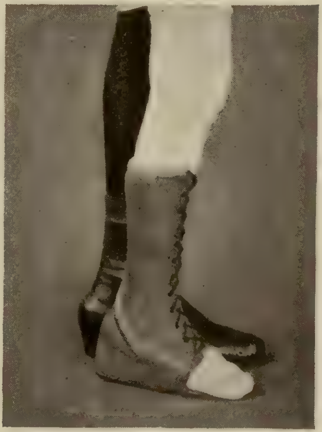

Fig. 592.—Patient wearing the leather anklet after astragalectomy. Lateral view.

OPERATION FOR RECURRENT TUMOR OF THE PATELLA. THE DIAGNOSIS AT THE TIME OF THE FIRST OPERATION WAS BONE-CYST. RESECTION OF THE LOWER HALF OF THE PATELLA

Case V.—This patient, a woman thirty-two years of age, was first seen about fifteen months ago. She complained at that time of a painful left knee of ten months' duration, and examination showed only an inability to actively extend the knee beyond 160 degrees and a tenderness over the lower part of the patella. The *x*-ray, however, showed a rarefied and cystic condition of the distal half of the patella, which was diagnosed as either a giant-celled tumor or a bone-cyst (Fig. 593). Two months later the patella was explored and a cavity containing clear fluid was found, the walls of which had the appearance of granulation tissue. At one point in the posterior wall of the cavity there was a perforation into the joint. The cavity was

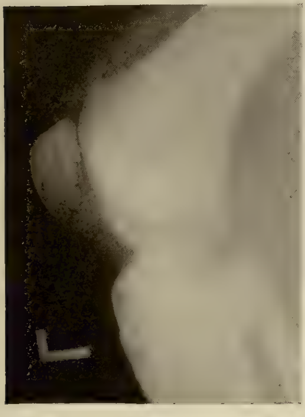

Fig. 593.—Cyst of patella.

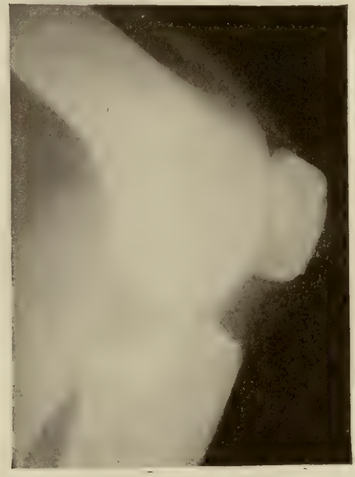

Fig. 594.—Cyst of patella three months after operation.

thoroughly cureted out and cauterized with pure carbolic acid. Healing occurred promptly. The pathologic diagnosis was benign bone-cyst, and this was concurred in by Dr. Bloodgood, who examined the *x*-rays and the tissue. The repeated *x*-ray examinations during the months following the operation seemed to show the cavity filling in with bone, and the condition three months later is shown in this film (Fig. 594). Four months from this time we were greatly surprised to find a recurrence of the cystic condition, and from that time to this, seven months, there has been a gradual increase in the process. This film, taken a few days ago, shows the present *x*-ray findings and there is apparently a projection of the bony and tumor tissue into the joint (Fig. 595). What the character of this growth is is problematical, but everything points to its being benign.

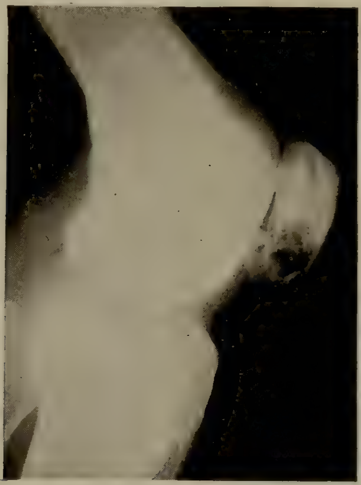

Fig. 595.—Cyst of patella. Recurrence after one year.

The operation will be performed under a tourniquet, as we do not want bleeding to interfere with the complete removal of the tumor mass. The curved incision around the bottom of the patella is carried down to the tendon and then the tendon itself is split longitudinally and separated from the anterior surface of the patella, but no signs of pathology are seen even with this complete exposure. With a small chisel the lower part of the anterior wall of the patella is removed, and we are now in the cavity shown in the *x*-ray. You will see that it is almost filled with a gray granulation, tissue-like substance which is evidently the tumor. There is no infiltration of the soft parts and we can apparently completely remove it. The whole lower half of the bone being involved, it is resected and the curet used to smooth off the upper fragment, which consists of very dense bone. The knee-joint cavity is widely exposed by this procedure (Fig. 596). Pure carbolic is now used to cauterize the raw bone surface and then neutralized with alcohol. The two halves of the tendon are now drawn together with mattress-sutures of heavy, chromic catgut and these longitudinal slits on either side allow a better approximation, although there is still a definite cavity between the tendon and the joint. When

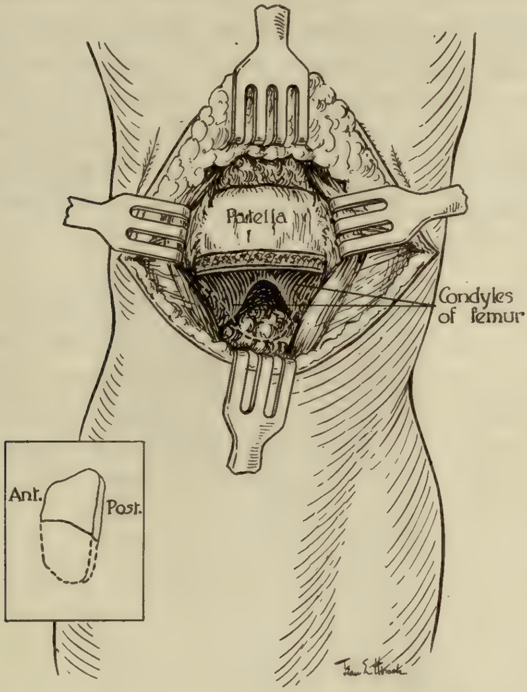

Fig. 596.—Operative removal of lower half of patella.

we consider the excellent function obtained in the fractures of the patella, even with a considerable separation of the fragments, there seems to be no reason why a useful knee will not be obtained in this case. You notice that no splint has been applied to the knee, but that enough immobilization is obtained by means of a large dressing reinforced with a thick layer of cotton. Movement of the joint will be encouraged as soon as possible.

The treatment of bone tumors cannot be discussed at any length here, but the principle we follow, even in definitely malignant cases, is to excise locally if entire removal of the growth can be obtained in this way. With benign cyst, simple cureting or removal of the lining membrane is all that is necessary except where mechanical reasons make excision advisable, as in this case. I am reasonably sure that all the tumor has been removed in this case, and even without the microscopic diagnosis we can hope for cure.

Note.—The sections of the tissue run through celloidin showed nothing but granulation tissue and the probability is that, due to poor bone regeneration, a granulomatous mass formed in the cavity of the cyst and invaded the knee-joint cavity through the perforation mentioned. Further studies will be necessary and this case will be reported fully later.

CHRONIC SUBACROMIAL BURSITIS WITH CALCIFICATION. SURPRISING RESULT FOLLOWS MANIPULATION DURING ACUTE EXACERBATION. DEMONSTRATION OF PATIENT AND x-RAY FILMS

Case VI.—This patient, an active professional man, was first examined about eighteen months ago, at which time he complained of a painful left shoulder. The findings were very typical of a chronic subacromial bursitis, and an x-ray showed a moderate amount of calcification, apparently in the supraspinatus tendon (Fig. 597). The symptoms lessened markedly under light exercises and only at times was there any real discomfort. One year later another x-ray was taken and the calcification had slightly increased, as is shown in this film (Fig. 598). Five months after this, following an evening of dancing, the shoulder became acutely painful and it was impossible for the patient to continue at his work. There was a definite swelling over the region of the bursa, but aspiration failed to

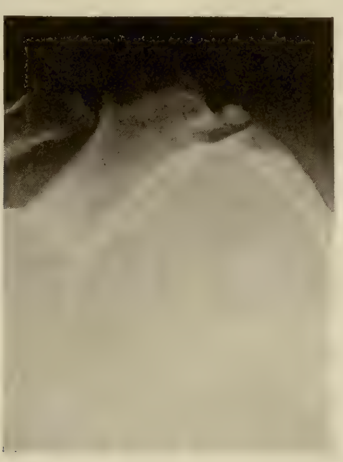

Fig. 597.—Calcification in subacromial bursa.

reveal any fluid. Tenderness was very marked and the slightest movement caused excruciating pain. This film was taken and it shows the calcification probably slightly increased (Fig. 599). Under gas-oxygen anesthesia the arm was abducted to the vertical position without the use of any force whatever being necessary. The pain following this manipulation was so intense that the arm had to be lowered a few hours later, and for the next few days large doses of morphin had to be given at frequent intervals. Hot packs were used almost constantly and seemed to give some relief. Fifteen days from the onset of this acute attack the patient was able to resume his occupation, and another *x*-ray was taken, when it was found that a large part of the calcification had disappeared (Fig. 600). The acute inflammation and the manipulation were probably the cause of this absorption. Today, two months later, the *x*-ray shows further absorption (Fig. 601).

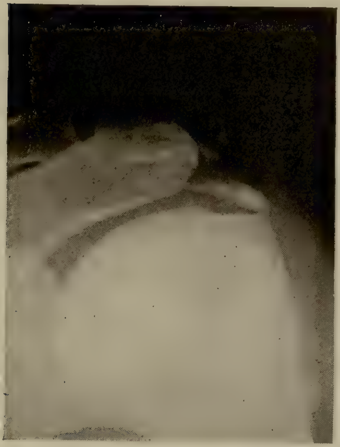

Fig. 598.—Calcification in subacromial bursa. One year later.

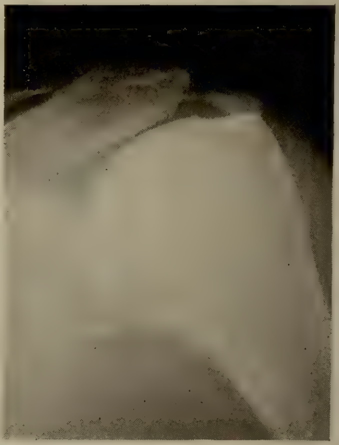

Fig. 599.—Calcification in subacromial bursa. Five months later.

On examining the patient the atrophy of the muscles of the shoulder-girdle is very apparent, although for six weeks the arm has been used fairly freely. Abduction can be performed for about 75 degrees, but the lifting of the arm above this point is accomplished only by tilting of the shoulders, as you can see. The rotations are also still limited in the extremes, and attempts to force them or the abduction causes some discomfort in the region of the bursa. There is only a slight amount of tenderness on pressure over the bursa.

The one point that I wish to bring out in this case is the peculiar action of the calcification. The case was observed for over a year, and during that time the calcification had increased to a very definite extent. An acute flare-up at the end of that time caused a remarkable absorption of the calcified areas and this process is continuing. It is well known that bursal calcification will frequently clear up spontaneously, but to see such a rapid reversal of the process is rather unusual. It also seems that the placing of the arm in abduction when calcification is present is contraindicated, as the mechanical irritation caused by the mass passing under the acromion may be very severe.

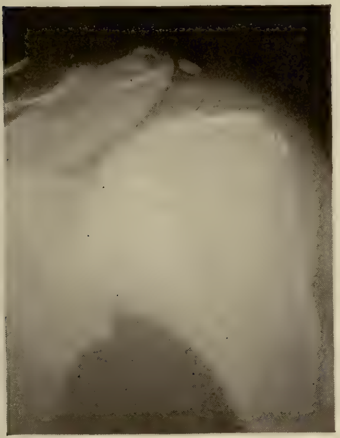

Fig. 600.—Shows disappearance of calcification after manipulation. Taken two weeks after Fig. 599.

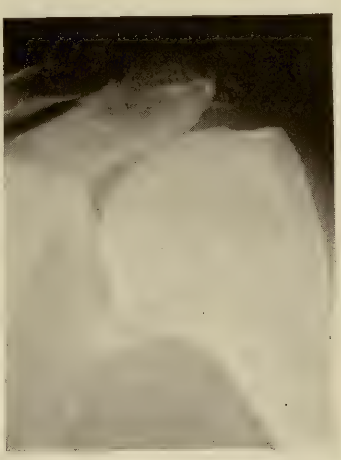

Fig. 601.—Condition two months after manipulation.

MANIPULATION OF SHOULDER FOR ADHESIONS FOLLOWING DISLOCATION. CAUSE OF SUCH ADHESIONS, PROBABLE PATHOLOGY, METHOD OF BREAKING UP, AND THE AFTER-TREATMENT

Case VII.—This patient, a man fifty-two years old, dislocated his right shoulder four and a half months ago. The arm was held at the side for over five weeks, and since that time he has been unable to work on account of the pain and stiffness. Active massage and manipulations have been used without much benefit and the range of motion has not increased for the last few months. Our examination showed some atrophy of the muscles of the shoulder-girdle, and a rather marked limitation of the motions of the shoulder-joint. Abduction was possible for 65 degrees and passively could not be forced much above this point. There was no tenderness and the *x*-ray examination was negative. The condition today is the same.

A diagnosis of periarticular adhesions has been made and we will attempt to break them down under gas-oxygen anesthesia, but will have to change to ether if relaxation cannot be obtained. Although this condition is probably mainly periarticular, there certainly are some adhesions to be found between the dependent folds of the synovial membrane, as has been pointed out by Thomas. Following any severe injury to the shoulder, where there is more or less hemorrhage and articular and periarticular effusion and infiltration, there is certain to be some organization later, and this will limit motion in the joint unless early steps are taken to prevent the tying down.

With this in mind we should always start motions as early as possible after any such injury. The indication for our treatment at the present time is the fact that even with massage and passive stretching there has been no improvement in the range of motion. There are two dangers to be guarded against in this forcible manipulation, and they are fracture of the neck of the humerus and dislocation of the shoulder-joint. The object of the manipulation is to break up all ahesions which have formed in and around the joint and thus free the parts for their full range of motion.

This procedure can be performed by the operator alone, but, if possible, two assistants should be used. We will have one assistant encircle the chest with his arms, the hands being clasped in the axilla so as to hold the scapula to the side, and the other place his fist in the axilla to prevent dislocation and support the humerus. The arm is now slowly abducted and you can hear the snapping of the adhesions, and we who are holding the patient can feel more giving way than can be heard. The scapula is allowed some motion after the arm starts above a right angle, and the normal range of abduction is obtained as we can see by comparison with the opposite shoulder. The elbow is flexed, and by using the forearm as a lever the full range of internal and external rotation is accomplished, with the tearing of further adhesions. The assistants now release all support and the shoulder is moved through its complete range. The arm will be held in complete abduction while the patient is taken to his bed, and it and the hand will be tied to the head of the bed for twenty-four hours. Active motion will then be instituted and the patient made to move the shoulder many times a day to the extremes of all positions. Physiotherapy will also be used to hurry recovery, and there is no reason why the adhesions should re-form if this after-treatment is followed.

AMPUTATION FOR OLD ANKYLOSIS OF THE KNEE DUE TO TUBERCULOSIS IN INFANCY, WITH DEMONSTRATION OF TEMPORARY ARTIFICIAL LEG WITH PLASTER-OF-PARIS SOCKET

Case VIII.—A girl eighteen years old, who came to the hospital desiring amputation on account of the disability caused by an ankylosed knee at the right-angled position, with a marked shortening of the extremity and paralysis of the muscles of the leg and foot. The active disease had started when the patient was two years old, and for many years following this there were discharging sinuses around the joint, which ultimately healed up, but left deep scarring and a stiff knee. Examination showed a condition which is best understood by looking at this photograph taken on admission (Fig. 602) and this *x*-ray film taken at the same time (Fig. 603). You will notice that there is an

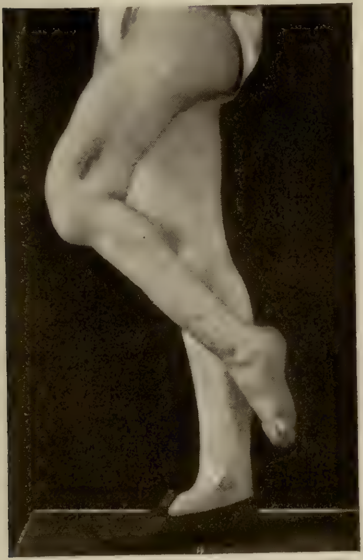

Fig. 602.—Old ankylosis of knee due to tuberculosis in infancy.

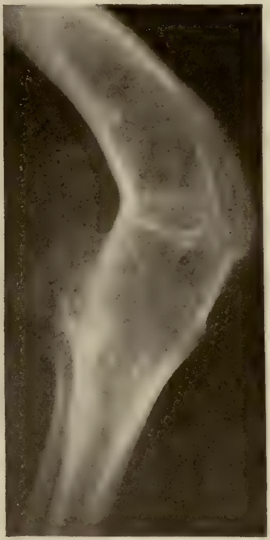

Fig. 603.—*x*-Ray of old ankylosis of knee due to tuberculosis in infancy.

absolute bony ankylosis with the formation of a medullary cavity through the region of the old knee-joint. It is only when you see a picture similar to this, showing the bone striæ running between the two bones, and the medullary cavity of one bone continuous with that of the other, that a definite *x*-ray diagnosis of bony ankylosis can be made. The muscles of this leg were completely paralyzed, and as a result the foot was flail. On account of the marked shortening and the paralysis, amputation was performed about seven weeks ago. The oblique method of Kocher was used, with the flap on the medial aspect of the thigh, as by this procedure the old sinus tracts were not disturbed. Absolutely no muscle tissue was seen during the operation and the entire flap consisted of fat and fascia only. Healing was uneventful and after the stitches were removed on the tenth day compression bandages were applied to accelerate the shrinkage of the stump. On account of the position in which the thigh had been held for so many years there was a permanent flexion of the hip to the degree shown in the picture, and as soon as the

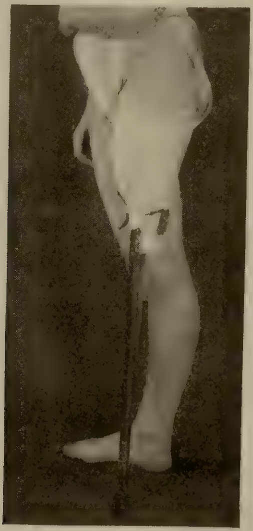

Fig. 604.—Patient wearing temporary artificial leg with plaster-of-Paris socket. Six weeks after amputation.

tenderness following the operation had subsided, sand-bags were placed on the stump to stretch the contractures. This was followed by daily manipulation in the Physiotherapeutic Department as soon as such treatment could be borne by the patient. In six weeks a temporary artificial leg was made, and you see the girl walking around on it today with perfect comfort (Fig. 604). The importance of the early use of such an appliance cannot be too strongly emphasized, and where the stump is freely movable and no contractures have to be overcome many cases can be walking around in less than a month from the time of operation. The making of these temporary artificial legs is not difficult and the detail of the technic can be found in an article by Wilson in the Journal of Bone and Joint Surgery for April, 1922.

CLINIC OF DR. HARRY P. RITCHIE

University Hospital, Minneapolis

SOME USES OF THE DERMAL GRAFT AND THE DELAYED FLAP

The literature of surgery has been involved for many years in the discussion of major conditions, and quite properly, as many of the questions and procedures are still unsettled. During this time plastic surgery has assumed a minor rôle and has been neglected except by the few, until the great need of thoughtful and expert work arose during the war. In recent years there have been very encouraging signs of a revival of interest, while papers presenting some feature of reconstructive work are appearing frequently. Revival is the proper word, since most of the accepted steps were suggested many years ago. But it is a revival only in this sense, that while many general and specific details are age old, they are now being discussed on a higher plane than ever before, and many questions are presented in a new light. A more direct application of the principles of surgery, a selection of operation for the case, and an exact and intimate study of the individual are signs of healthy progress.

The work and teachings of Gilles, Blair and Davis, and of many others have stimulated thought and attention to this feature of surgery.

There is an ever-increasing field for this specialty, namely, in the injuries of civil practice, the traumatisms of industrial work, and the gross malignancies about the head and neck. It is necessary to show results not only from a cosmetic standpoint, but for the yield in functional increase. Much of this surgery depends on the consent of the patient in our civil practice or the consent of responsible parties in our industrial work. Failures result in an economic loss which if frequent discourage every one concerned. The point is that proper results can be obtained by careful, but never by haphazard, surgery.

There are two proceedures the application of which have been so startling in their results and of such general application that they are the most interesting features of this work. They are the dermal graft and the delayed flap.

The dermal graft or the Woulfe skin-graft is described as a full thickness or whole skin-graft. The two latter terms may be misinterpreted to mean the skin and underlying tissue, leading to the transference of uncleaned skin which invites failure and leads this graft into disrepute. We should, therefore, select and adopt a positive descriptive term for common use, and the dermal graft has been suggested.

The Thiersch graft is of such universal use either for clean or granulative surfaces that it is almost synonymous with the term "skin-graft." It is an "epidermal graft."

There was a debate as to whether the Reverdin graft was an epidermal or dermal graft. As far as my experience goes it makes no difference which it is, but with the other two we should make definite distinctions as indicated in the descriptive terms.

I. The Dermal Graft.—(*a*) It may be cut to pattern, size or form does not matter.

(*b*) It requires a fixed base, as pressure is an essential principle.

(*c*) The graft and the area applied must be clean and dry.

Two things may happen to this graft.

1. *Necrosis.*—This looks like a clean death, or a dry gangrene, not always over the whole graft, although it may be. But if an attempt is made to remove this graft before ten days or two weeks it will be impossible to do so without tearing it off. In 3 cases, 2 of which I show, there are left only small areas of granulation. The very under surface adhered, and while these 2 cases are listed as partial failures, we found that it acted as a wonderful dressing, albeit a rather expensive one, and that both surfaces yielded to a follow-up epidermal graft. In these 3 cases

grafts were placed on movable bases—one on the axilla and on the chest wall and the other on the inner surface of the elbow.

2. *Superficial Infection.*—This comes as a small vesicle which extends serpiginously. I first thought that it was a pressure necrosis, but those more experienced have informed me that it is an infection which responds promptly to a mild silver nitrate application.

II. The Delayed Flap.—This flap is based on well proven principles and experience, and may be used in several ways:

(*a*) It may be cut on its pedicle and then replaced in its original bed for ten days or two weeks. This procedure owes its importance to the fact that it admits of cutting a narrow pedicle to a wide or rounded flap. The vessels thrombose, the inflammatory reaction becomes quiet, and it recovers comfortably in its own bed.

(*b*) The flap may be raised and left attached at both ends. This allows the area from which it is raised to heal. One end is later detached and swung from the other end as a pedicle. It is particularly applicable where body and cushion are required in the immediate vicinity of the flap.

(*c*) The flap may be raised and left attached at both ends. Later one end is detached and sewn to another area with a view of "jumping" the flap.

All of these plans have uses and are especially valuable where it is necessary to transfer skin with the underlying tissues and make up defects which require body in their reconstruction. It is possible to use both the dermal graft and the delayed flap to advantage in the same case.

Most of the cases were treated with the advice and assistance of Drs. A. MacLaren and L. E. Daugherty, in my private practice, and of Dr. A. S. Strachauer and Dr. A. A. Law, in my public teaching service at the University Hospital.

A. Contractures About the Neck.—Case I.—Figure 605 shows the use of the single flap, cut along the lines indicated in the picture and left attached at both ends. In two weeks the contracture is dissected out and the lower end of the flap is cut, transferred, and sutured in place. The difficulty is in estimating the extent and form of the denuded area. The flap may not always fit. Of course, it is possible to transfer the flap immediately, but the danger of this procedure is that the blood-supply at the lower end may be interfered with. This single flap may be cut from the back and transferred with the base at the neck.

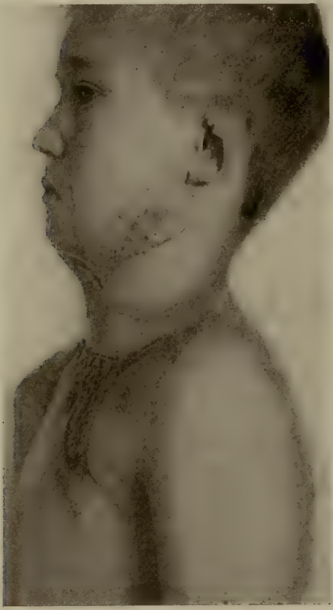

Fig. 605.—Case I.

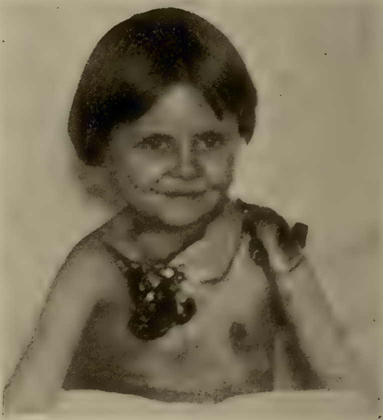

Fig. 606.—Case II.

Case II.—Figure 606 shows the use of the same type of flap taken from both sides with the plan of making the transfer after the form of a cravat. In this case the flap is taken from the left shoulder and right chest respectively.

Figure 607 shows the end-result. Occasionally in the use of flaps a web along one or the other of the suture lines forms as shown in the picture. This can easily be dissected out. The flaps are applicable where the contractures are limited to the neck tissues only.

Case III.—Figure 608 illustrates a different problem. While in the first and second cases the chin was not involved, in the third case it will be observed that the chin is gone and the mucous membrane of the lower lip is so everted as to reach below the clavicle. After consultation with Dr. MacLaren I decided to try the dermal graft. The contracture was dissected up in order to loosen the chin freely. The graft was then taken from the left abdomen and sewn into the wound, the size and extent of which is shown in the picture in Fig. 609. A starch bandage and gauze pressure was applied in the effort to give positive contact with the base tissues.

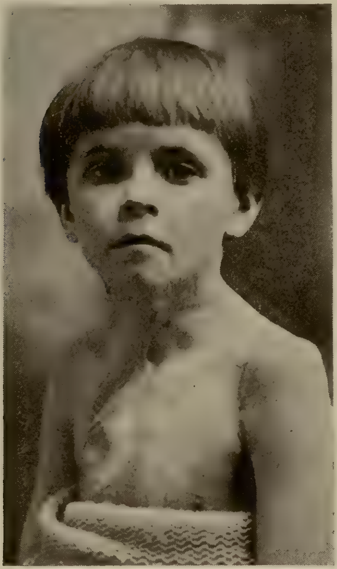

Fig. 607.—Case II.

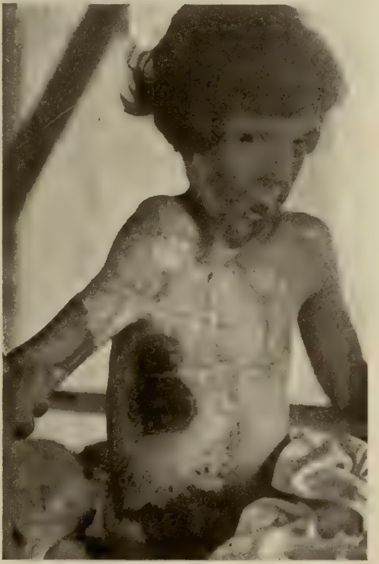

Fig. 608.—Case III.

Figure 609 shows that wherever positive pressure was obtained the graft took. Half-way between the mentum and the mucocutaneous border of the lower lip is shown the upper margin of the graft. This was a complete take throughout one-half of the area shown. The lower half, where it was difficult to obtain pressure, failed, undergoing a type of necrosis mentioned in the first part of the paper.

The next step was the dissection and loosening up and inversion of the lower lip which left a denuded area on the upper part of the chin. A crescentic dermal graft was then taken and placed in this area, with a complete take.

Figure 610 shows the result, although the picture does not fairly illustrate it, as she can completely hide the mucous membrane of the lower lip. The lower part of the chest has been covered by an epidermal graft.

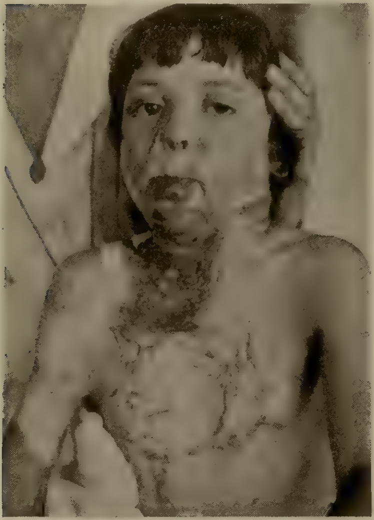

Fig. 609.—Case III.

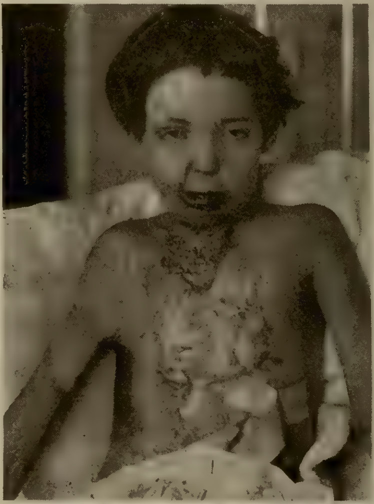

Fig. 610.—Case III.

Case IV.—This shows repair following an operation for malignancy. This case had had various preoperative diagnoses made, but was proved to be a carcinoma. It had been operated upon and subjected to radium, how efficiently I do not know. Figure 611 shows the condition when the patient came under my care. The operation was performed by the thermocautery method, which in Fig. 612 shows the result of a complete unilateral neck dissection, removing the submental, submaxillary, salivary, and anterior carotid chain of lymph-glands, with exposure of the ramus, leaving an enormous defect. This area was dakinized. In ten days the area was measured and a pattern

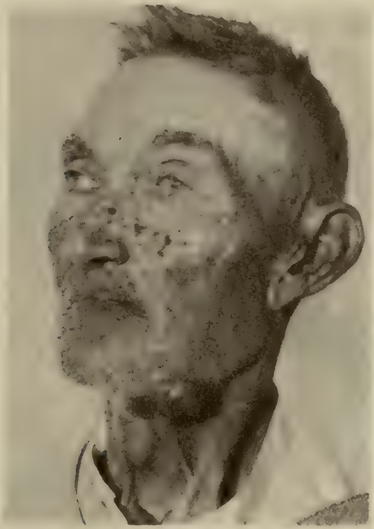

Fig. 611.—Case IV.

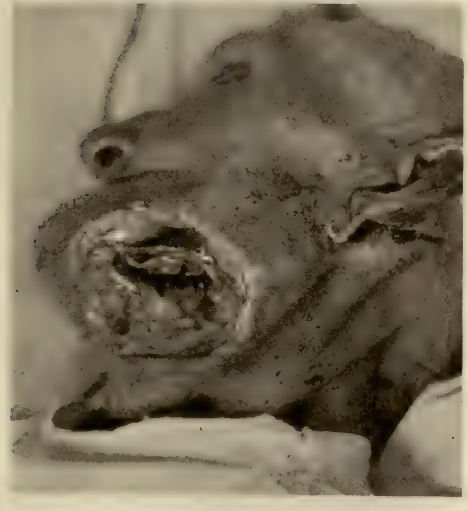

Fig. 612.—Case IV.

made and transferred to the lower neck. A flap was then outlined with the base below the ear. The flap was raised, all bleeding surfaces caught, the flap replaced, and sewn in its own bed. In ten days the stitches were removed and the flap transferred to a granulating surface. At the same time the denuded area was covered with an epidermal graft. Figure 613 was taken soon after the removal of the dressings. There was still some discharge on the flap which makes it look as though there was a failure of union, but the flap did take. This shows that a flap cut to pattern with a narrow pedicle may be successful even on granulating surfaces.

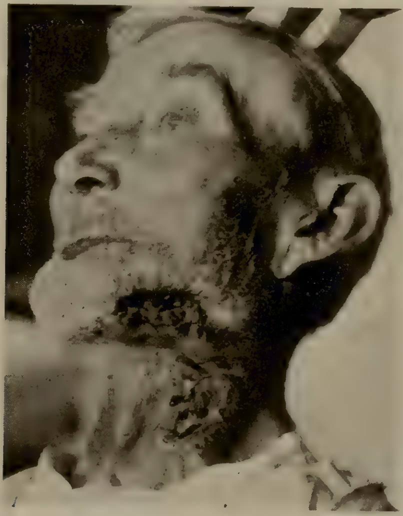

Fig. 613.—Case IV.

It is my experience with the thermocautery that wherever a bone is denuded, a sequestrum may be expected within any period up to six months, and in this case in four months a 2-inch piece of bone was removed.

B. Contractures About the Axilla.—Case V.—If limitation of motion is due to web, this may be taken care of by incising the tissues in different planes on the anterior and posterior surfaces and connecting the incisions by bisecting it. This plan is shown most graphically in former numbers of these clinics by Dr. E. Wyllis Andrews.

When the contracture is due to a distinct keloid there is no opportunity for carrying out this procedure. In the case as shown in Fig. 614 a linear flap was cut from the arm, left attached at both ends, and protected by gutta-percha tissue in an effort to prevent tubulization. In ten days the keloid was excised and the flap transferred, as shown in Fig. 615. The result of this procedure was that a thin web contracture formed on

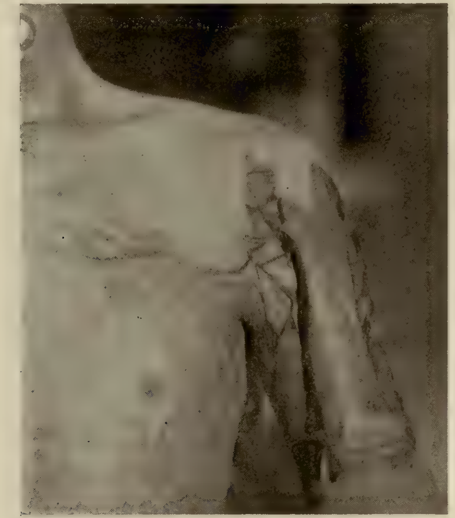

Fig. 614.—Case V.

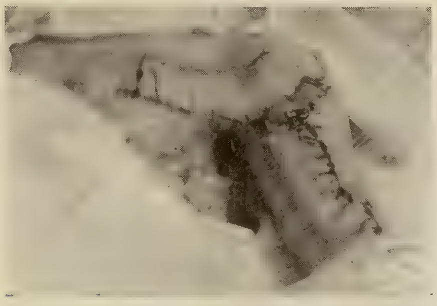

Fig. 615.—Case V.

the lower suture line, as shown in Fig. 616, so that his abduction was about 45 degrees. This contracture was then removed and the arm placed in full abduction. This left a raw area on the arm upon which a dermal graft was placed, with a complete "take." The end-result on this man is that he can raise the arm to full extension above the head.

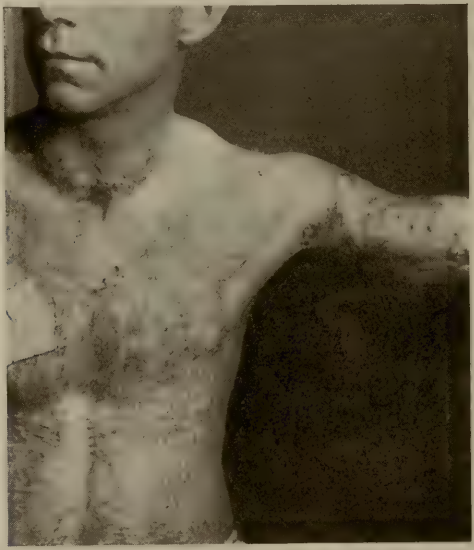

Fig. 616.—Case V.

Case VI.—Figure 617 shows an extreme burn of the chest and arm, involving the axilla. The extreme abduction is shown. The area on the arm shows the result of an epidermal graft, extending from the axilla to below the elbow-joint. I could not plan any flaps, as the contracture of the axilla was keloid and involved the anterior and posterior margins. After dissection the arm was raised into a position of complete abduction. There was one unburned area of skin in the apex of the axilla, and this was transferred by a pedicle flap to the arm, and he now has hair growing on the arm at least 4 inches from the central point of the axilla. A dermal graft was cut from the abdomen and sewn into the wound. In ten days there was a complete necrosis.

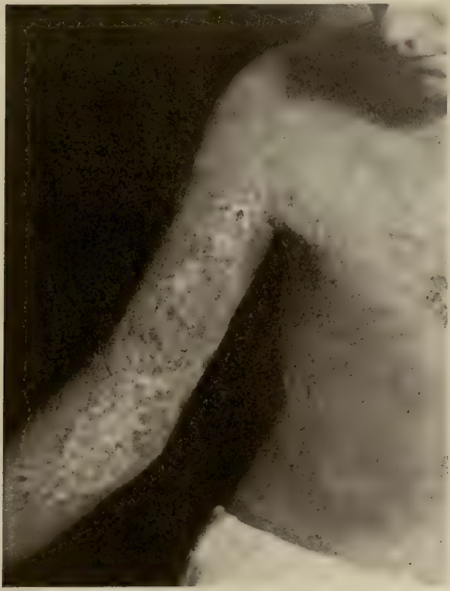

Fig. 617.—Case VI.

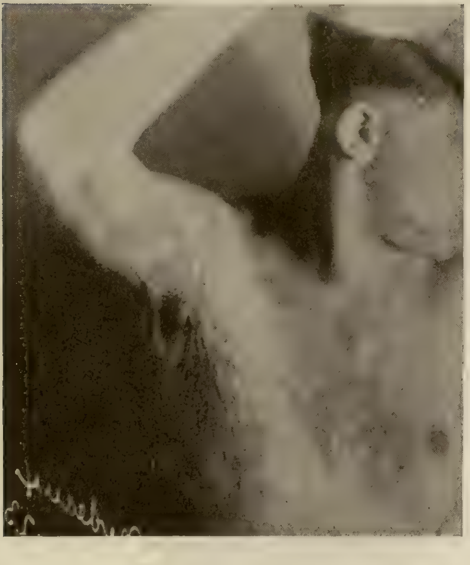

Fig. 618.—Case VI.

It was practically impossible to obtain constant pressure. The surface left after the removal of the dermal graft was beautifully clean, therefore an epidermal graft was applied and held in place by a mold of dental wax, with a "take" as shown in Fig. 618. This is a rather roundabout way to obtain results. This case raises the question as to the division of credit between healing in extension and the effect of the graft.

C. A Combination Use of the Dermal Graft and the Delayed Flap.—Case VII.—Figure 619 shows the casts of the right and left ears of a three-year-old boy. The right ear illustrates the usual form of microtia. The plan followed was this:

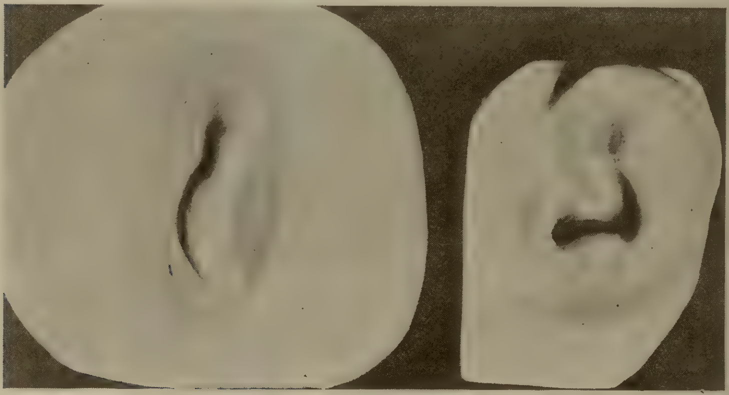

Fig. 619.—Case VII.

A pattern was cut to fit as nearly as possible the left ear, principally to get the aggregate area of the front and back. This was reverted and transferred to the cast of the deformed ear. The child was then etherized and a flap cut according to this pattern, except that it was made square, as shown in Fig. 620. This flap was then lifted up, all surfaces dried, and replaced in its own bed and sewn in place. In two weeks the stitches were removed, the flap raised and folded, as shown in Fig. 620. The envelope thus was held in place by three $\frac{1}{2}$-inch mattress-sutures threaded through a piece of fine catheter, thus giving a fixed contact at the base of the envelope. The cut margins above and below were approximated by single sutures. A dermal graft was cut from the left abdomen and sewn into the denuded area resulting from the elevation of the delayed flap. The posterior cut margin was sewn to the anterior cut margin

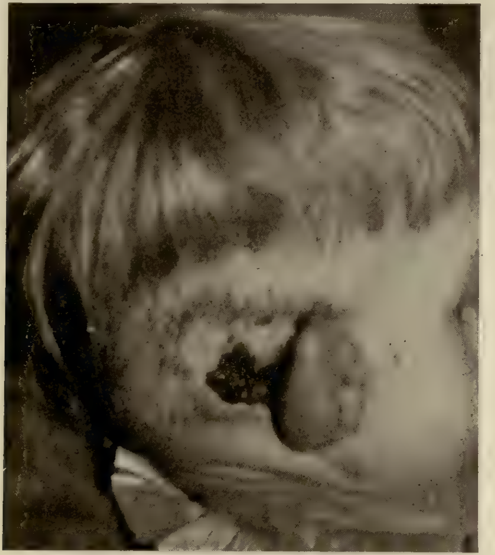

Fig. 620.—Case VII.

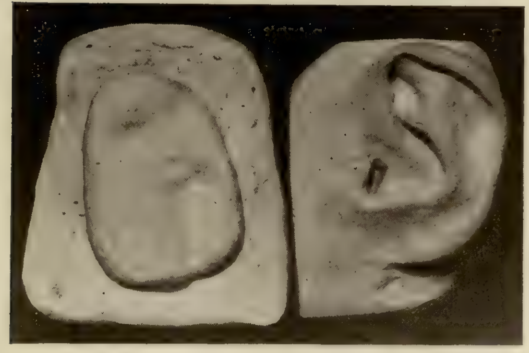

Fig. 621.—Case VII.

of the graft with what, to me, is an astonishing result of a clean primary union of two transferred tissues. The dark area in Fig. 620 is an exhibition of the serpiginous vesiculation mentioned in the first part of this paper. The color is due to the application of a mild silver nitrate solution.

Figure 621 shows the size of the flap. The cast represents it as flat and is incorrect in that it is, if anything, too evident. This, of course, may result in a flaccid ear, and if this becomes too marked it is my plan to separate the wings of the envelope and insert some costal cartilages.

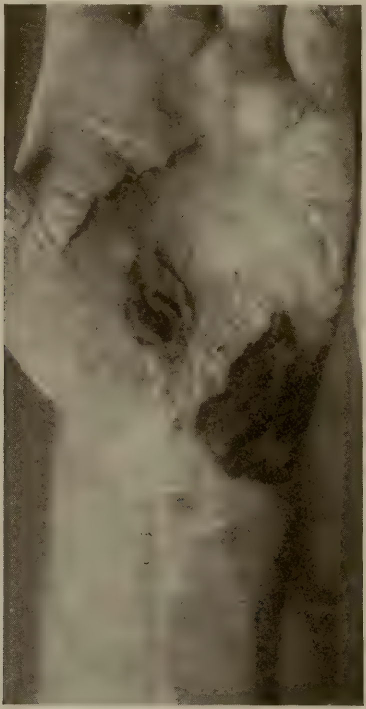

Fig. 622.—Case VIII.

D. Complete Transference of a Flap.—Case VIII.—Figure 622 shows an electric burn on the hand with destruction of all tissues, resulting in a horny, crackling, fixed, and painful area.

Figure 623 shows the flap raised from the right abdomen and the use of the gutta-percha to prevent tubulization. The lower end was cut, the area on the hand dissected out, and the flap sewn in as shown in Fig. 624. The flap is shown to be tubulizing, and

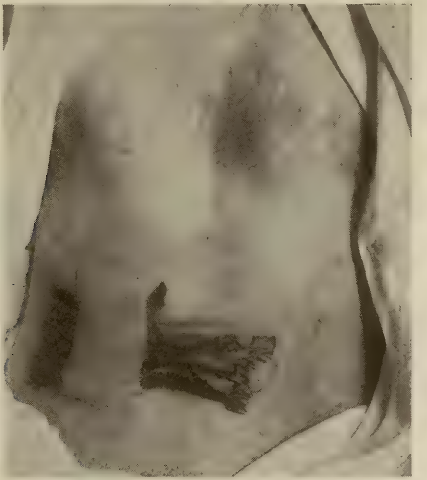

Fig. 623.—Case VIII.

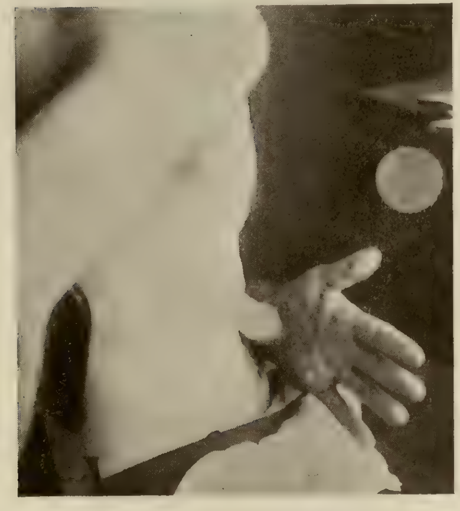

Fig. 624.—Case VIII.

depending upon its length arises the question as to whether this should not be done surgically at the time of the hand suture. Three weeks should pass before the upper end of the flap is cut away.

Figure 625 shows the transference and result of this plan. The principle of life to this flap is different than that of the dermal graft. Here the blood-supply comes from the margin, and the objection to this plan is that it takes a long time after transferring the flap for it to become adherent except at its margins. It is necessary to follow up these cases by a course of bandaging and pressure, but the eventual result is very satisfactory.

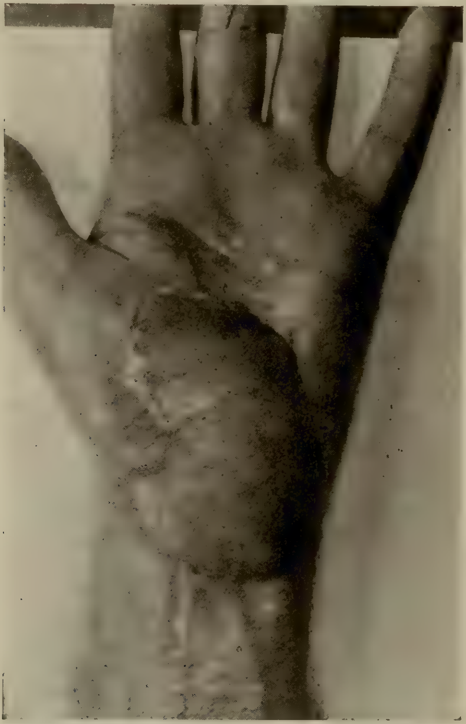

Fig. 625.—Case VIII.

I have also been trying out some delayed flaps on the palate, but do not feel prepared to make any comments upon this procedure at this time, and I believe that the delayed flap is surgically applicable to the hard palate only, and that it is postively unsurgical to attempt any such plan on the soft palate. There have been some suggestions by New which have opened up great possibilities for postoperative defects. But in considering this subject I am gradually coming to the conclusion that the delayed flap may assume great value as a primary procedure in certain forms of cleft palate.

Conclusion.—As I have indicated, all of the above procedures are well known and the only possibility of advance will be the application of them to the individual case. The dermal graft is difficult of accomplishment, and my present position is that I have a great deal to learn about it, and that its use by surgeons may lead to startling results.

CLINIC OF DR. EMIL S. GEIST

St. Mary's Hospital, Minneapolis.

FOOT DISABILITY: AN ANALYSIS OF 781 CONSECUTIVE CASES

An extremely prominent orthopedic surgeon commented deprecatingly on the capabilities of a confrère as follows: "He's an orthopedic surgeon from the ankle down."

No orthopedic surgeon cares to be called a "foot specialist." Nevertheless and notwithstanding, it is a fact that a considerable percentage of the cases appearing in the office of the orthopedic surgeon are cases of foot disability, and a résumé of the 781 foot cases seen in two consecutive years of private practice has brought forth a number of observations perhaps worth recording.

We are apt to consider the human foot as an organ finished in its developmental plan. Nothing could be further from the truth. While in the process of evolution the hand, for instance, has become specialized and developed in a wonderful manner, the foot has remained behind in the race.

Professor Herbert Walter, of Brown University, in a book on the "Human Skeleton," speaks of the "handy hand" and the "makeshift foot." In no portion of the human anatomy does one find a greater variation in the shape, size, and contour of the relative constituent parts of an organ than in the human foot.

As pointed out in a previous paper by the author (Supernumerary Bones of the Foot—A Roentgen Study of the Feet of One Hundred Normal Individuals, American Journal of Orthopedic Surgery, 1914) about one-third of all normal feet present accessory bones; most of these are probably simply relics and remnants of a prehistoric time. Some of these accessory bones occupy the same historic position in the human anatomy as the appendix, tonsils, and other organs which are destined, in the last analysis, for the anatomic scrap heap.

To quote Walter verbatim: "Human feet have never quite recovered from their surprise at finding the body tipped up on end and in having thrust upon them the entire responsibility of its support. They have done the best they could in the evolutionary time they have had with the inherited materials that were on hand, but it must, nevertheless, be confessed that the result is as yet only a makeshift foot. The various foot troubles of man are an eloquent confirmation of this statement.

In the first place, man needed to have a considerable part of the foot bent at right angles to the leg, so that it would come in contact with the ground and thus prevent the body from tipping over forward. At the same time, a part of the foot, namely, the heel, had to be detailed to project in the other direction to prevent tipping backward. Thus the human foot became plantigrade as a mechanical consequence of bipedality. The swift horse, which perhaps has the most successful locomotor appendages of any quadruped, has no more need of plantigrade feet than the legs of a table which maintains perfect equilibrium without flat-foot."

We begin, therefore, with the premise that the human foot developmentally is still an unfinished organ. In addition to the fact that feet are makeshifts, we, the civilized portion of the human race, put them into leather containers and walk upon unyielding surfaces, when the original intention was that we should walk barefooted on grass or soft ground.

We have, even in well-fitting shoes and artificial floors at best, unnatural conditions to deal with. Is it any wonder that we see cases of foot disability as an every-day occurrence, considering the ill-shaped shoes and the hard floors which we find ever present?

Large factories are engaged in widely advertising and making thousands of so-called arch supporters. It must be that these factories have a certain justification for their existence and that their wares give a certain amount of comfort to the footsore. In no other way can one explain the continued existence and growth of these firms. Unfortunately, the shoe clerk who fits these devices is not gifted with the art of differential diagnosis, and it has been my experience in nearly every case of chronic foot trouble, no matter what its origin or pathology, that the patient arrives at the office wearing some form of commercial "flat-foot" brace. In other words, harm is often done and valuable time lost.

The study of the records of these 781 consecutive cases shows that only about one-third of them are of the type classed as ordinary weak (or flat) foot. In the other two-thirds there was real, definite, localizable pathology present.

The cases of this series can be grouped as follows:

Weak Foot.—Two hundred and fifty-nine cases. (Of these, 37 were of the rigid type.)

Other foot conditions accompanying or simulating weak foot, 390 cases.

Toe Disabilities.—One hundred and thirty-two cases.

Weak Foot.—Two hundred and fifty-nine cases. The symptoms of ordinary weak foot are too well known for repetition here. Slow in onset, chronic, bilateral, more pain on standing than on walking, no pain at night, and multiple tender points about the feet are perhaps the outstanding features. The cause is always to be found in that the foot, the muscles of which are often artificially weakened by tight or badly fitting shoes, or following illness, is required to sustain a load too great for it. The proper treatment consists, first, in essentially strengthening the musculature of the foot which, as we all know, extends above the knee. This is one of the most important features in the treatment of simple weak foot. Second, the foot must be put into a well-shaped shoe and stocking. Considering the variety and variation of human foot, there is no one type of shoe made which is conformable to all feet. One of the best average shoes which exist today is the "Munson Army Shoe" which was adopted for army use some years ago and which was tried on a large scale during the mobilization of our great army, and which was not found wanting. It seems the best average shoe made today. It is easily procured for men; not so easily for women.

During the painful period the shoe may be tilted so that the inner border is raised, an easy and satisfactory device being the tomahawk wedge.

The proper exercises, combined with a properly modified shoe, will adequately take care of about 80 per cent. of all cases of simple weak foot; in the remaining 20 per cent. some form of metal arch support becomes necessary. However, the arch support should be prescribed with as much reluctance as one should use in giving a crutch to a cripple who possibly might do without it, or in giving morphin to a patient.

The 390 cases of other foot conditions accompanying or simulating weak foot are divided as follows:

Acute foot strain	14
Exostosis, foot	8
Weak foot, arteriosclerosis	25
Weak foot (disturbance of accessory scaphoid)	12
Weak foot and varicose veins	9
Weak foot—gonorrheal infection	7
Foot, miscellaneous	28
Foot, arthritis	39
Foot, fracture	10
Foot; tuberculosis	11
Foot, hollow	4
Foot, infectious	15
Foot, metatarsalgia	64
Foot (weak with hallux valgus)	11
Foot, general atrophy	4
Calcis, spur	20
Calcis, fracture	11
Calcis, miscellaneous	18
Weak foot, with short tendo achillis ("muscle-bound foot")	80

Weak Foot with Arteriosclerosis.—Twenty-five cases of this series presented arterial changes in the feet. The symptomatology is not that of ordinary weak feet. The cases are usually bilateral. In our series there were 2 cases unilateral. It is observed slightly more in males than in females (males 18, females 7); average age was about fifty. Nearly all of them complained of pain at night. Cramps are a frequent symptom.

The wearing of metal arches usually causes increased discomfort. The feet get cold easily. Fairly frequent symptoms are swelling and numbness of the feet. On examination, the feet are cold. In all cases the pulse of the dorsalis pedis artery, or of the posterior tibial, is either absent or very much diminished. *x*-Ray frequently shows marked atheromatous changes. In 7 of the cases there was a history of excessive use of coffee, and in 5 an excessive use of tobacco. This trouble occurs frequently in Hebrews. Nearly all cases gave a history of having tried various forms of arch support, with either no relief or actual increase of symptoms. While not very much can be promised to these cases, considerable relief is afforded by, first, the alternate hot and cold baths morning and evening; second, warm stockings, especially at night. Third, exposure to sunlight, real or artificial.

Differential diagnostic features are the pain and cramps at night, increase of pain from wearing arches, and the absence of the pulse of the foot arteries. (*x*-Ray often helps in making a diagnosis.)

Weak Foot with Varicose Veins.—There were 9 cases of weak foot observed in which varicose veins were the chief etiologic factor. Four were in males and 5 in females; average age of forty-four years. The outstanding feature here is that in addition to the fact that proper shoes must be worn, adequate attention must be paid to the varicose veins either by elastic stocking or by operation.

Chronic Arthritis of the Feet.—Thirty-nine cases. The age varied from twenty-six to sixty, average age being thirty-seven. Males 15; females 24; this condition was found unilateral in 2 cases. In 14 cases there were the signs of chronic arthritis in other joints. There was an old history of acute articular rheumatism in 9 cases. In 12 of these cases we held the tonsils responsible, and in 7 the teeth. In 2 of these cases the onset was two weeks after an attack of tonsillitis, and in 3 cases the onset was two or three weeks following la grippe. In 4 of the cases, there was distinct history of recent exposure to cold.

The symptoms of chronic arthritis of the feet simulate those of ordinary weak foot. Differential diagnosis is often extremely difficult. Whenever possible, the diagnosis of chronic arthritis should, however, be made, as prognosis in chronic arthritis is not nearly so good as in simple weak foot.

On careful examination of such a patient a beginning arthritis can often be made out in other joints of the body (perhaps only in a finger or two), of which the patient himself may not be aware. The *x*-ray offers considerable aid in most cases. On the picture there can be seen, especially in older cases, the characteristic "lipping" at the articular margins. Pain at night is a characteristic symptom and is often severe. The wearing of arch supports usually increases the pain and is a very suggestive sign. The treatment of chronic arthritis is disappointing. Plenty of warmth, warm stockings, large shoes with felt inserts often give relief. Sunlight, long-continued, on the Rollier plan, sometimes gives relief.

Tuberculosis of the Tarsus.—Eleven cases. Average age of twenty-five years, age ranging from sixteen to fifty. Males 5; females 6. In 5 cases a definite history of injury. Nearly all of these cases were mistaken for flat-foot, especially at the beginning of the symptoms. In 2 of these cases this mistake was made by the writer. We should be extremely chary in calling a unilateral foot condition "weak foot." Weak foot is almost always bilateral, while tuberculosis, of course, is practically always unilateral. Several of these cases of tuberculosis of the tarsus appeared with flat-foot arches, which seemed to increase the pain. *x*-Ray usually settled the diagnosis, combined with the history and physical findings (swelling, local heat, general temperature).

The treatment is that of surgical tuberculosis elsewhere. In 2 cases it was possible to remove totally the disease aread by means of a transverse resection of the tarsus. Several other cases did well by means of right-angle fixation splint, combined with the Rollier sunlight treatment. Several of the cases dropped from observation. One case submitted to amputation.

Illustrative Case.—C. S.; male; age eighteen; Swede; farmer; previous health, tonsillectomy two months ago, otherwise negative. History of present illness: Seven months ago, when patient was hauling and unloading sand, noticed some 'pain in right foot; foot began to swell on the top after a week or so; foot kept getting a little worse gradually until about four months later, when he stopped working and went to a physician, who applied a plaster cast. Since then patient has been lying around the house doing no work. Cast remained on for two weeks, then another one applied. Casts have been applied ever since. Conditions has been getting worse. During the past week patient has hardly been able to sleep.

Present complaint: Pain in the arch and through the body of the foot. Hurts nearly all the time. Patient has been using crutches for the past five months. No trouble with other foot.

Physical findings: Right foot markedly swollen over the mediotarsal region. Considerable atrophy of the musculature of the leg. Swelling is general. However, it is most marked on the dorsum. Slight swelling of the toes; marked local heat of the dorsum of the foot, also tenderness. Some tenderness on deep pressure over the plantar portion of foot. No reddening. On measurement, about $1\frac{1}{4}$ inches of swelling. Wassermann negative. Tuberculin, subcutaneous, positive. *x*-Ray shows tuberculosis involvement of Lisfranc's joint. Operation, transverse incision; U-shaped flap, excision of Lisfranc's joint. Plaster cast. Primary healing. One year later patient is walking on foot. Foot is somewhat shortened, otherwise normal. Motions of toes O. K.

Weak Foot: Gonorrheal.—Seven cases. Average age twenty-five. All male. Time of onset of foot symptoms after gonorrheal discharge two weeks to four months. The exact relationship of gonorrhea to so-called gonorrheal flat-foot is not yet definitely established. However, the occurrence of this trouble after the original infection is regular enough to warrant the belief that there exists an etiologic relationship. Moreover, this form of foot complaint is extremely unyielding to any form of therapy. The outstanding feature of therapy is to recognize not only the necessity of treating the foot condition but also to take care of the primary infectious focus located in the genito-urinary apparatus.

Foot Infection.—Fifteen cases. These cases are to be divided as follows:

	Cases.
Osteomyelitis, calcis	1
Periostitis, metatarsal region	3
Infectious bursitis, tendo achillis	1
Generalized osteomyelitis, foot, chronic	2
Metatarsal osteomyelitis	7
Osteomyelitis, scaphoid	1

Chronic osteomyelitis, which is due to a germ of low virulency, may sometimes superficially simulate weak foot. It is, of course, easy to differentiate. The trouble is unilateral. x-Ray and blood-count usually clinch the diagnosis, together with the history of the case. Treatment of osteomyelitis is the same as that elsewhere. Owing to the fact that it is difficult to obliterate old, bony cavities in osteomyelitis of the tarsal bones, the writer has, in 2 cases, used a free fat transplant in filling up these cavities.

Miscellaneous Pathologic Conditions.—Twenty-eight cases. These cases were divided as follows:

	Cases.
Foreign bodies, unsuspected:	
Needles	4
Pebbles	1
Piece of leather	1
Glass	1
Periostitis	3
Bursitis (about malleoli)	1
Lipoma	2
Achillodynia	4
Gout	1
Tenosynovitis	2
Hysteria	3
Raynaud's disease	1
Lues (tendon)	2

Foot, Weak (Disturbance of the Accessory Scaphoid).—Twelve cases. As far as the writer knows, this condition has not been previously described. Ages range from twelve to forty-three, average age being eighteen. Occurred eight times in females and four times in males. Symptoms were unilateral in 8 cases and bilateral in 4 cases. The unilateral: right foot

5; left foot, 3. *x*-Ray showed unilateral accessory scaphoids in 5 and bilaterals in 7 cases.

The accessory scaphoid is a structure which has been observed for many years. It occurs normally in from 12 to 16 per cent. of all feet. It may be large or small, unilateral or bilateral. At times this normal structure gives rise to pain. A few of the patients gave a history of slight injury, the majority, however, gave a history of no injury. The pain and tenderness are confined to the region of the scaphoid and *x*-ray reveals the presence of an accessory scaphoid. In 5 of the cases the trouble was severe enough to warrant removal of the accessory scaphoid, which resulted in complete cure. Two of the cases got well without operation, 1 case is still complaining, the remaining 4 cases were lost sight of. This condition has mistakenly been termed "a fracture of the scaphoid due to mild injury."[1]

Foot. Fracture.—Ten cases. Fractures of the tarsal and metatarsal bones often go unrecognized at the time of the injury, Nearly all of the above 10 cases were seen a long time after the occurrence of the fracture and came complaining of indefinite, painful foot symptoms. Occasionally, the history of trauma is difficult to elicit either because it was so slight or because so much time had intervened. While most of the cases were seen at periods of four to six months after the fracture, 1 case was seen thirty-nine years after the occurrence of the fracture and another case fifty years after.

Fractures of the metatarsals are especially prone to cause more or less painful symptoms. Especially is this true with the fractures of the base of the fifth metatarsal, which is often unrecognized at the time of occurrence, and if not taken care of properly will produce a painful foot condition lasting for months.

Foot. Exostosis.—Eight cases. Owing probably to the wearing of too short shoes, a frequent exostosis is to be found at the base of the first metatarsal. In our series there were 5 cases of distinct thickening in this location. In 1 case there was an exostosis below the internal malleolus, and in 2 cases an exostosis below the external malleolus, mechanically interfering with proper function of the ankle-joint.

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[1] This disease process may be the same one as is often present in the juvenile hip (Legg's disease) or in the adolescent knee (Schlatter-Osgood knee).

Acute Foot Strain.—Fourteen cases. Acute foot strain is sometimes differentiated with difficulty from the ordinary type of weak foot, with the exception that here again, as a rule, we have a unilateral instead of a bilateral condition to deal with. There is a definite history of moderately severe trauma. The ordinary type of Gibney strapping is usually all that is necessary in these cases.

Weak Foot with Hallux Valgus.—In 11 cases there was distinct association of marked hallux valgus with ordinary flat-foot symptoms. It goes without saying that the condition of weak foot cannot be treated until the hallux valgus is properly taken care of. In this connection it is also well to say that calluses and corns are frequent conditions accompanying weak foot, and must be properly dealt with if we are to achieve success in the treatment of ordinary weak foot.

Spurs of the Os Calcis.—Twenty cases. It must be remembered that spurs of the calcis are structures sometimes found in supposedly normal feet. In a series of one hundred painless feet, they were found in 2 cases. However, these spurs are usually the result of chronic infection, sometimes due to gonococci and sometimes following some other form of infection, such as la grippe. In a patient afflicted with heel pains we are sometimes able, by means of *x*-ray pictures extending over a period of months, to show the development of a calcaneal spur. Normally, there exists in the same region a large bursa which may be the chief source of trouble. In the treatment of these spurs it is well to remember that their removal usually means a cure; however, not always. In removing them one should always be careful to remove the bursa, or bursæ, which are adjacent. It is sometimes a question whether the removal of the bursa *alone* would not be enough to effect a cure in most cases.

Fracture. Os Calcis.—Eleven cases. Fracture of the calcis is a severe injury. Most cases occur as a result of falls on the feet in a standing position. The writer has seen 1 case in which the opposite was the case. A sewer, over which the patient was standing, exploded, thus shattering the calcis. The orthopedic surgeon sees most of these cases after a lapse of months. The average time these 11 cases were seen was at about six months; the longest one being fourteen months after the injury.

x-Rays of all these cases show, as a rule, marked displacement of the fragments and consequent deformity and thickening ot the os calcis. In one such case of fresh fracture of the calcis a U-shaped incision was made about the heel, the entire calcis was laid bare, and the shattered fragments were brought into accurate apposition and held there by means of multiple loops and ties of chromic catgut, with a perfect result. In several of these cases the patient came to the consulting room with a diagnosis of traumatic flat-foot; an almost unpardonable mistaken diagnosis since the use of the *x*-ray is available.

Calcis, Miscellaneous.—Eighteen cases. Under this heading the following cases may be classed:

Achillodynia	1 case	
Exostosis (calcis)	1 "	(in rear of calcis)
Bursitis	3 cases	
Apophysitis	1 case	
Periostitis	3 cases	
Tuberculosis calcis	1 case	
Cyst calcis	1 "	
Osteomyelitis	2 cases	

Weak Foot. With Short Tendo Achillis.—Eighty cases. About ten years ago the writer called attention to the frequent occurrence of a short tendo Achillis with weak foot, and pointed out that a short tendo ochillis stood in etiologic relationship to the weak foot. Long before this time, Schaffer, of New York, had also pointed to the same etiological factor of a great many cases of weak foot. Since this time a number of contributions on the subject, by Hibbs and others, on the "Muscle Bound" Foot, called further attention to this subject. In routine examination in the army it has been estimated that at least 10 to 20 per cent. of the flat feet were due to this condition of shortened tendo achillis. The degree of shortening can be moderate or severe. It is often, although not always, due to the high-heeled shoe so often worn by women. In a number of cases a short heel cord was found in children from five to fifteen years of age. In severe and aggravated cases the remedy consists in an achillotenotomy. This, however, is not to be done until every other means for the relief of pain has been exhausted, as section of the tendo achillis is a severe operation, often seriously incapacitating the foot. In those cases, however, which are carefully selected great improvement results, not only as far as the relief of pain is concerned but also in the function and appearance of the foot. In a larger group of cases the tendon can be stretched by means of correctly applied plaster-of-Paris bandaging. It is often surprising how the arch will reconstitute itself after stretching or section of the tendo achillis. We all know that in paralysis of the posterior leg musculature there often occurs a marked increase of the normal arch of the foot (hollow foot). A similar process takes place when a short tendo achillis is lengthened.

Toe Cases.—One hundred and thirty-two cases. The cases of toe pathology in this series were subdivided as follows:

Fracture	9
Gout	8
Hammer-toes	15
Hallux rigidus	10
Hallux valgus	61
Osteomyelitis	4
Tuberculosis	3
Miscellaneous	22

Conclusion.—In conclusion it may be said that cases of foot disability are to be carefully studied and *not* called "flat-foot" indiscriminately. It will be found that *many* of these cases can be *excluded* as not belonging to the ordinary type of static foot disability, but fall into one or the other of the groups listed above. Since intelligent *treatment* is based upon correct diagnosis, the importance of making the differentiation is obvious.

LOOSE BODY, KNEE, FOUND BENEATH EXTERNAL SEMILUNAR CARTILAGE

The following case is of interest because of the unusual place in which the loose body was found. Repeated *x*-rays (see accompanying tracings, Figs. 626, 627) showed the loose body apparently anchored in the same place in the region of the external meniscus.

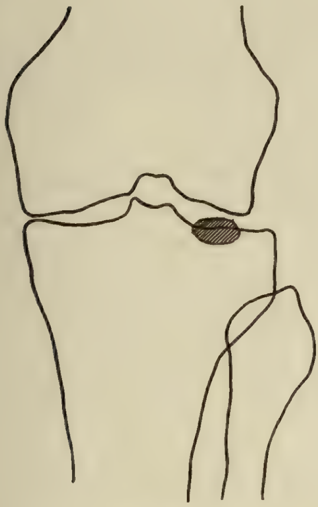


Fig. 626.

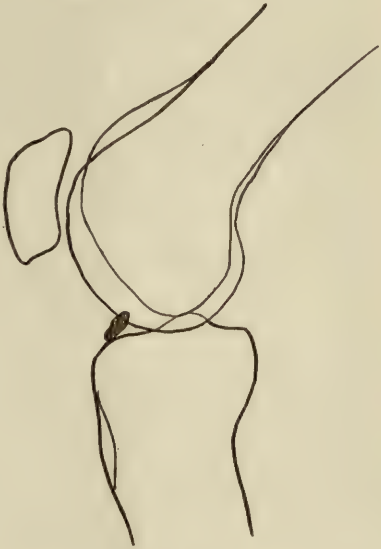


Fig. 627.

On opening the joint through a curved (Jones) incision the loose body sought for was not seen as readily as was anticipated. In fact, it was only after considerable instrumental search that it was finally located beneath and completely hidden by the external meniscus. The loose body had inserted itself between the lower surface of the external semilunar cartilage and the upper surface of the tibia. It was not adherent and was easily "popped out" of place after it was located.

Case Report.—No. 5951. Injury thirteen years ago. "Sprained knee." Plaster cast for two months. Knee has always been a trifle weak. No particular trouble for about eleven years until patient sprained the knee again. Following this second injury, repeated attacks of locking; occasionally several of these attacks in one day. Knee swelled after nearly every attack.

On examination (December 3, 1921) there existed marked swelling and effusion of the knee-joint. A plaster-of-Paris cast was accordingly applied to allow the effects of trauma to subside. By December 28th the knee looked normal; December 30, 1921 operation. Curved incision; 6 to 8 c.c. of bloody fluid evacuated. After considerable search the loose body was found located beneath the external semilunar cartilage. On examination of the lower end of the femur it was possible to note that the loose body had been extruded from the mesial edge of the internal condyle (osteochondritis dissecans). Subsequent course of events favorable. Reactionless wound healing and complete relief from symptoms of locking.

ALBEE BONE-GRAFT OPERATION IN TUBERCULOSIS OF THE SPINE. A FEW UNEXPECTED RESULTS

The following 5 cases (of 75 Albee bone-graft operations in tuberculosis of the spine) present elements of interest. In 2 cases a second tuberculous infection occurred in the spine at a distance from the site of the first infection. One of these patients submitted to a second bone-grafting operation in order to rigidify another portion of the spine.

Fracture of the graft occurred in 1 case.

In 2 cases there occurred paralysis while the patient was lying in bed recovering from the effects of the bone-grafting operation.

Case I.—No. 6059. Female, aged thirty-two. Typical tuberculous spine. Destruction of body of seventh dorsal. Albee bone-graft operation September 25, 1918, followed by heliotherapy. Perfect result until January, 1922, when patient reports small kyphos beginning in the upper lumbar region. *x*-Rays show marked involvement and destruction of second lumbar vertebra. Operation February 2, 1922: Typical Albee operation, immobilizing lower dorsal and practically the entire lumbar spine. April 1, 1923 patient was doing well and not complaining of symptoms; attending to her work.

Case II.—No. 3354. Male, aged tewnty. Typical tuberculous spine; involvement of bodies of first and second lumbars. Albee bone-graft operation March 13, 1919. Patient considered himself cured until March 2, 1923. *x*-Ray now shows tuberculous definite involvement of ninth and tenth dorsals, surrounded by typical fusiform tuberculous abscess.

Case III.—Fracture of Graft.—Female, aged twenty-five. Typical tuberculous spine. Tenth and eleventh dorsals affected.

Slight amount of angulation. Albee bone-graft operation. Reactionless healing. Remained "well" for about two years, when sudden onset of pain following mild injury. *x*-Rays revealed fractured graft and increase of the amount of bony destruction of the bodies in the infected vertebræ. Went elsewhere for second Albee operation and, according to report, is doing well.

Case IV.—Paralysis.—No. 4748. Male, aged thirty-eight. Tuberculous spine. Seventh and eighth dorsal vertebræ. Small definite kyphos. Knee reflexes slightly increased. Typical Albee operation Janurary 5, 1920. Patient did nicely for about one year, after which time gradual onset of paralysis. Leg reflexes markedly increased. Put to bed immediately, where he remained for about one year. Paralysis gradually disappeared and patient is now walking about, apparently cured of his tuberculous spine. Gait is slightly spastic. Reflexes still markedly increased.

Case V.—Male, aged forty. Tuberculous spine. Involvement of eleventh and twelfth dorsals. Fairly well-marked kyphos. Reflexes normal. Albee operation February 14, 1921; typical Albee operation. Reactionless healing. Patient quite restless in bed. Eight weeks following the operation beginning "numbness" in legs. Reflexes became exaggerated. In spite of absolute rest in bed paralysis progressed so as to become total, and gradually involved bladder and bowels. Patient's general condition became poor, and he died five months following the operation.

GENU RECURVATUM FOLLOWING RESECTION FOR TUBERCULOSIS

THE following illustrates what can happen to a knee-joint which has been resected when no proper protection has been given. It is, of course, well known that following resection of the knee the knee should be protected by means of a plaster splint, or other form of brace, for at least a year in order to prevent flexion contracture.

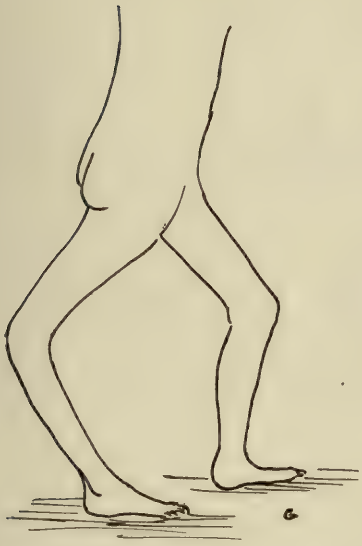


Fig. 628.

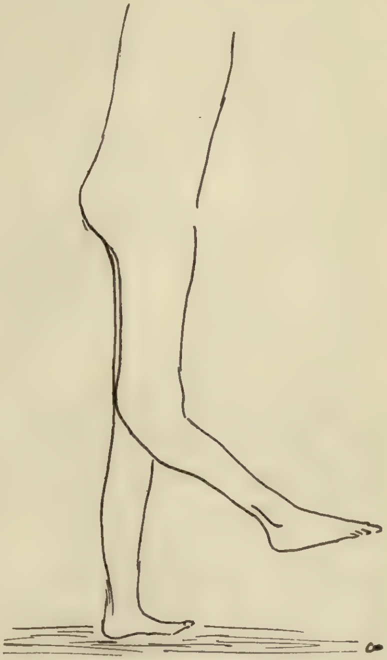


Fig. 629.

In this particular case deformity resulted in the opposite direction (genu recurvatum) (Figs. 628–630). Bony ankylosis existed, and by means of a wedge osteotomy the deformity could be easily corrected.

Case Report.—No. 3363. First operation: A resection of right knee for tuberculosis (this resection done elsewhere seven years ago). The deformity commenced about one year following the resection. At the time of our first examination the deformity existed as shown in Figs. 628, 629.

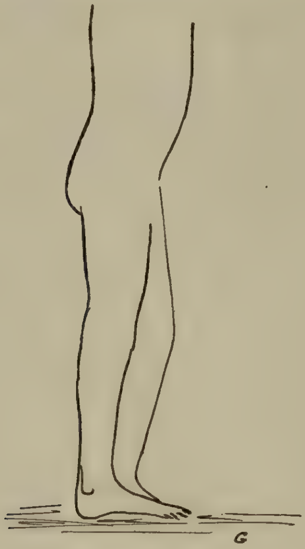


Fig. 630.

Second operation (April 1, 1914): Wedge-resection; plaster cast followed by brace which was worn for about two years. Result shown in Fig. 630.

BIESALSKI'S OPERATION, PANASTRAGALOID ARTHRODESIS IN TUBERCULOSIS OF THE ANKLE

Upon recommendation three years ago by Dr. Fred Gaenslen, of Milwaukee, the writer has performed this operation six times on advanced cases of tuberculosis of the ankle-joint in the adult; cases which, in my opinion, might otherwise have been considered amputation cases. Four cases are too recent to report at this time. Two cases here reported were both operated in December, 1921, and the patients are now walking on their feet without pain and are apparently cured. The accompanying sketch (Fig. 631) shows that the arthrodesis involves the ankle-joint, the subastragaloid joint, the astragalonavicular joint, and the calcaneocuboid joint. Complete fusion in all these joints must be aimed for.

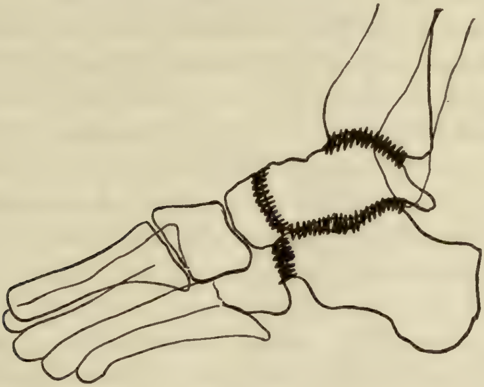


Fig. 631.

Case I.—No. 5990. Female, aged twenty-five. Sprained left ankle March, 1919. Laid up a week at the time. Swelling and pain on outer portion of ankle. Bandaging relieved condition. Feet all right after that except she frequently turns the ankle. About March, 1921 grdaual onset of swelling. Three casts applied. Has used crutches from time to time. Present complaint: Pain and swelling in ankle. Patient limps.

Examination.—Left ankle: Marked swelling. Contours of ankle-joint effaced. Chief swelling in region of external malleolus. Fluctuation. Considerable tenderness over the ankle-joint, especially anteriorly. Foot held markedly extended. All motions painful. Foot can only be brought to about 110 degrees dorsiflexion. Considerable local heat. Great atrophy of the leg musculature. *x*-Ray shows typical tuberculous involvement of both tibia and astragalus. Diagnosis, tuberculous ankle. Wassermann negative.

Operation (December 24, 1921): Whitman incision. Eight or 10 c.c. of tuberculous "pus" which contained tubercle bacilli encountered. Articular cartilages of lower end of tibia, as well as upper end of astragalus, were loose and partially detached. Considerable erosion of articular cartilage. Involvement of the astragalocalcane joint. Complete denuding by means of chisel and gouge of the tibio-astragaloid, the astragalonavicular, the astragalocalcaneal, and the calcaneocuboid joints. Plaster cast. Twenty-four-hour drain. Repeated casts following this until September, 1922, when brace was applied. Heliotherapy ever since operation. Sinus closed. Wound completely closed in July, 1922. December, 1922 brace discontinued. April, 1922 patient walking on foot. Absolute ankylosis at ankle-joint. Foot painless.

Case II.—No. 5932. Male, aged nineteen. Left ankle: Gradual onset beginning about June, 1919. "Sprained ankle" frequently. In June, 1921 gradual onset of swelling. Pain about ankle-joint. Patient began to limp. Wore metal splint until day of examination.

Present complaint: Swelling of ankle. Pain on use. Patient walks with crutches. On examination (November 29, 1921) foot in marked equinus. Left ankle swollen so that entire joint contours were effaced. Considerable local heat. Fluctuation. Atrophy of the leg musculature.

Operation (December 12, 1921): Typical Biesalski pan-astragaloid arthrodesis. Plaster casts applied and reapplied until about August, 1921. This followed by brace. Patient is now walking with brace, ankle and foot being practically normal, absolute ankylosis at ankle-joint having supervened.

CLINIC OF DR. JOSEPH D. LEWIS

Minneapolis General Hospital

EXTERNAL NASAL DEFORMITIES OF TRAUMATIC ORIGIN. REPORT OF SIX CASES

Until comparatively recent years the treatment of external injuries of the nose was included in the scope of the general surgeon's field of endeavor. But now, largely because of a better and broader training and a more comprehensive knowledge of the external and internal structures of the nose, this highly specialized work is generally delegated to the rhinologist. In addition to being more familiar with the anatomic and physiologic phases of the subject, and because of greater experience and improvements in methods, the modern rhinologist is able to achieve by intranasal subcutaneous procedures, and thus avoid a scar, that which the general surgeon, perforce, accomplishes by an external approach. Furthermore, the majority of external nasal wounds are accompanied by intranasal injuries which, if not properly managed, frequently result in functional impairment. Therefore, in addition to obtaining a satisfactory cosmetic result, successful treatment of nasal injuries must include measures which will re-establish the intranasal function.

Injuries to the nose are common, ranging in degree from contusions, dislocations, and compound comminuted fractures, to injuries so formidable that the nose is partially or completely destroyed. But this article is limited to a consideration of the more common injuries which embrace fractures and dislocations of the nasal bones, the nasal process of the superior maxilla, perpendicular plate of the ethmoid bone, and the triangular cartilage of the septum. The vomer, even in extensive fracture dislocations, usually escapes injury.

The following 6 cases detailed in the succeeding context have been selected for the reason that they seem quite representative of the common types of nasal deformities caused by traumatism.

REPORT OF CASES

Preparation.—The nares are cleansed by spraying with warm Dobell's solution. The skin of the nose, forehead, a part of the cheeks, and upper lip, are sterilized with McDonald's solution, and the head and face covered with a moist sterile towel, through which an opening is made to expose the nose.

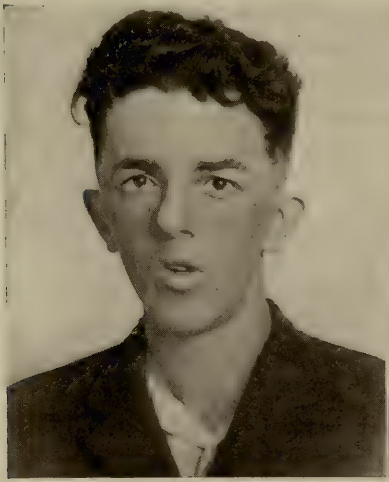


Fig. 632.

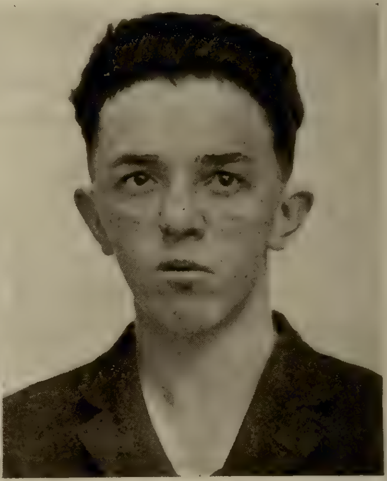


Fig. 633.

Fig. 632.—Case I. Preoperative appearance.
Fig. 633.—Case I. Postoperative result.

Anesthesia.—The nasal mucosa is sprayed with a 1 per cent. solution of cocain, containing 20 drops of epinephrin to the ounce, and followed by two or three applications of a 20 per cent. solution of cocain. The cutaneous tissues are anesthetized by circumferential infiltration of a $\frac{1}{2}$ of 1 per cent. novocain solution to which 10 drops of epinephrin have been added.

Case I. (Figs. 632, 633).—This lad, aged fifteen, was injured during infancy, and as a result of a fracture-dislocation of the cartilaginous portion of the nasal septum the nose is markedly deflected to the right. The greatly deviated and thickened nasal septum has left very little space in either nasal chamber and, as a consequence, plainly indicated in the accompanying photograph, he is a confirmed mouth breather.

Operation.—Immediately following a submucous resection of the nasal septum, with knife and forceps introduced between the mucoperichondrial flaps, the remaining superior portion of the triangular cartilage was separated from its attachment to the perpendicular plate of the ethmoid bone. The nose was then forced as far toward the left side as possible and there retained with a gauze collodion dressing for a period of ten days. Functionally and cosmetically the result is satisfactory.

Case II (Figs. 634–637).—About ten years ago this man, aged sixty-four, received an injury which crushed the left nasal bone and dislocated the right. Intranasal examination disclosed a deflected septum due to a fracture of the perpendicular plate of the ethmoid and the triangular cartilage of the septum. His nose, like that described in the preceding report, was deflected from the median line.

Operation.—The soft tissues over the nasal bone, infraglabellar notch, and the nasal processes of the superior maxillæ were elevated by the intranasal subcutaneous method, and the nasal bones disarticulated and reset to conform as nearly as possible to their original position. On the side of the depressed fracture a Simpson-Bernay tampon was introduced between the septum and the nasal bone (then moistened to cause it to expand) to retain the bone in its proper position. The right nasal bone, now freed of its attachments, was returned to its normal position as nearly as the scar tissue would permit, and a dry Simpson-Bernay sponge, corresponding in shape to the nasal bone, was placed over it and held in place with several strips of adhesive plaster, applied in laminated fashion from cheek to cheek—a method originally suggested by Dr. Harmon Smith—and the sponge moistened to increase the pressure by its expansion.

Subsequently, a submucous resection of the septum will be necessary to restore intranasal configuration, and also to correct the lateral displacement of the lower portion of the nose, as in the preceding case.

Fig. 634.

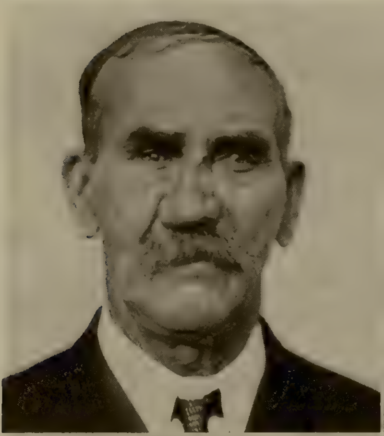
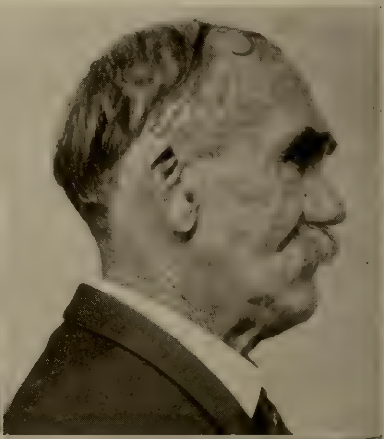


Fig. 635.



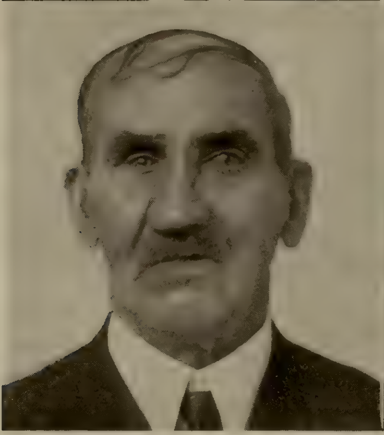


Fig. 636.

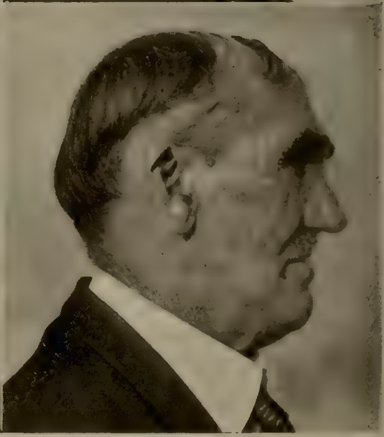


Fig. 637.

Figs. 634, 635.—Case II. Preoperative appearance.
Figs. 636, 637.—Case II. Postoperative result.

Case III (Figs. 638–641).—This man, aged seventy-two, was injured about fifteen years ago when he was thrown from a vehicle, and as a result of direct violence the right nasal bone was crushed and depressed, the left also being fractured and dislocated.

Fig. 638.

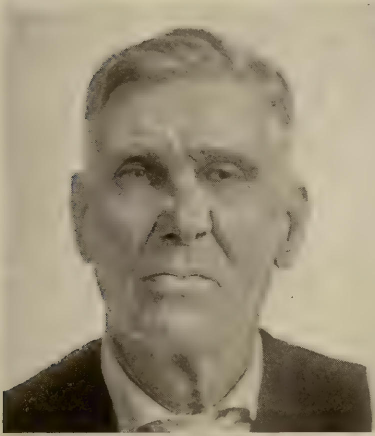
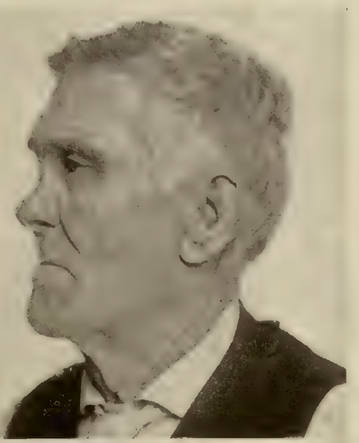


Fig. 639.



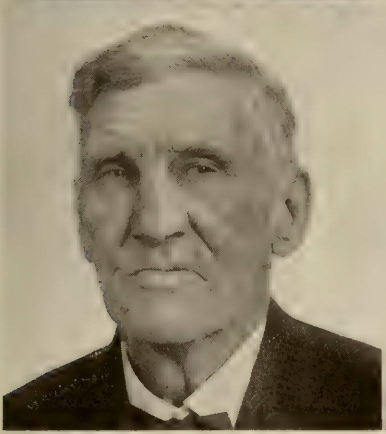


Fig. 640.

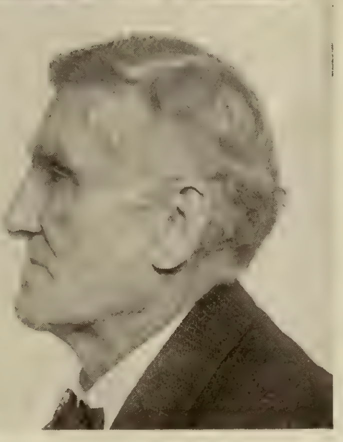


Fig. 641.

Figs. 638, 639.—Case III. Preoperative appearance.
Figs. 640, 641.—Case III. Postoperative result.

Operation.—The nasal bones were returned to their original positions and there retained by procedures similar to those described in the preceding case, which yielded a very satisfactory result.

Fig. 642.

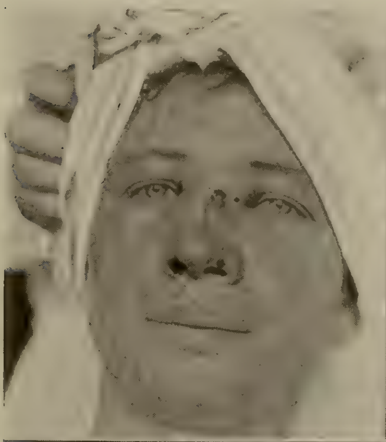
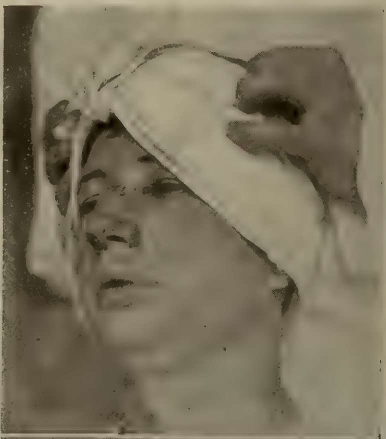


Fig. 643.



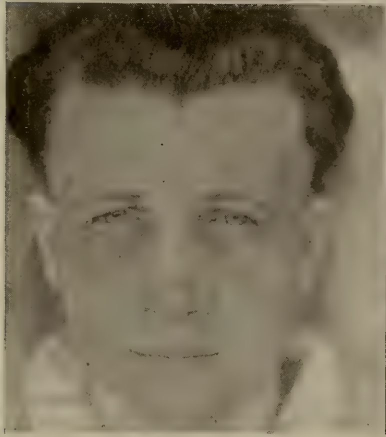


Fig. 644.

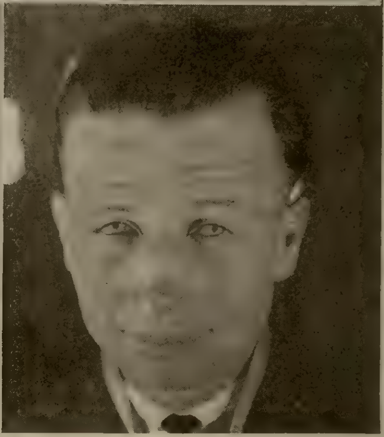


Fig. 645.

Figs. 642, 643.—Case IV. Preoperative appearance.
Fig. 644.—Case IV. Four days after operation.
Fig. 645.—Case IV. Final.

Case IV (Figs. 642–645).—Twelve hours ago this patient, aged twenty-five, received a heavy blow with the fist in the region of the left nasal bone and, as shown by the accompanying photograph, there is a compound comminuted fracture and depression of the left nasal bone. The right nasal bone has been dislocated outward and downward so that about one-third of it rests on the nasal process of the superior maxilla. The perpendicular plate of the ethmoid also was fractured and the posterior portion of the nasal septum is deflected toward the left. The depression between the nasal bones and tip of the nose existed prior to the injury.

Operation.—With a strong elevator, introduced intranasally, the left nasal bone was forced upward into its original position, and a Simpson-Bernay tampon, anointed with 10 per cent. bismuth paste, inserted between the septum and nasal bone to maintain it in its normal position. The fractured and dislocated columella was straightened by applying pressure with Roe's forceps and held in place with a Simpson-Bernay sponge introduced into the left nasal chamber. The pressure of the sponges is increased by causing them to expand with moisture. The sponge splints are changed daily and discontinued on the fourth day. By manual manipulation and pressure the dislocated right nasal bone was easily reduced, and a dry Simpson-Bernay sponge, shaped to correspond to the size of the bone, was placed over it and held in position with several strips of adhesive tape. If desired, the pressure exerted by the dry sponge may be increased by moistening it. Cosmetically and functionally the result is excellent.

Case V (Figs. 646–649).—This patient, a medical student aged twenty-four, received a compound comminuted fracture while playing basket-ball May, 1916. A general surgeon partially reduced the dislocation and sutured the wound. Two weeks later during a baseball game he suffered another injury in the same region and a spicule of bone was removed by an external incision. Since that time there has been a slow overgrowth of osteoid tissue producing a dorsal hump, as shown in the accompanying photographs.

Operation.—In addition to the preparation previously described, the nasal vestibules were tightly packed with cotton tampons. The hump was removed by the author's nethod, the technical steps of which are as follows: A vertical incision is made in the lower half of the columna nasi (Figs. 650, *A*, 651, *a*) and the tissues of the nasal tip undermined with small blunt curved scissors, as indicated by the dotted lines (Figs. 650, *B*,

Fig. 646.

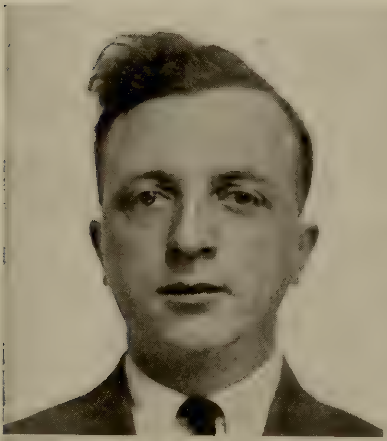
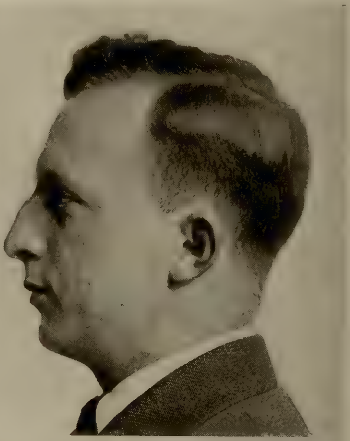


Fig. 647.



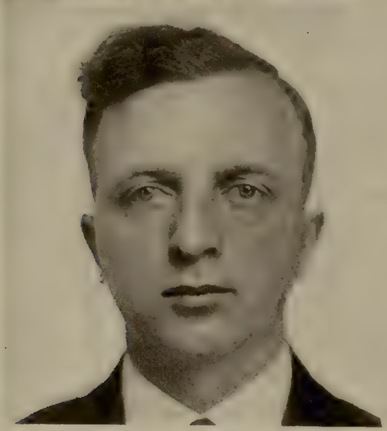


Fig. 648.

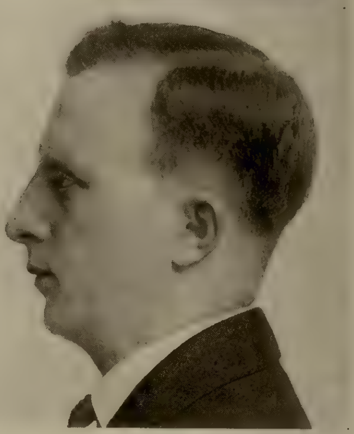


Fig. 649.

Figs. 646, 647.—Case V. Preoperative appearance.
Figs. 648, 649.—Case V. Postoperative result.

651, *b*). Then with the same scissors, introduced on the flat, the tissues over the tip of the nose and nasal bones are released.

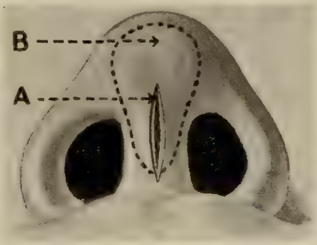


Fig. 650.

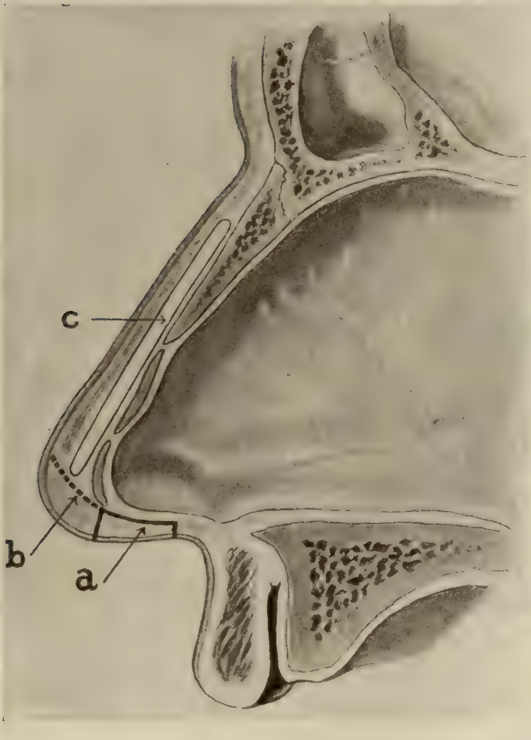


Fig. 651.

Through the large pocket thus made the hump was removed with special rasps. The bony fragments having been flushed out with warm sterile water, the columnar incision was closed with two sutures. A dry Simpson-Bernay sponge was placed over the dorsum of the nose and held in position with several adhesive strips, then moistened to increase the pressure and thus prevent the formation of a hematoma. The dressing was removed in twenty hours and the sutures two days later.

Comment.—The subcutaneous method of gaining access to the nasal dorsum, described above, being based on sound anatomic, surgical, and cosmetic principles, has the following advantages over the procedures hitherto proposed for the same purpose: The field is amenable to sterilization, rendering infection an almost negligible factor; the parts being readily accessible to manipulation, the technic is simplified and traumatism minimized; annoying hemorrhage is avoided; the small incision promptly heals without leaving a visible token of the surgical intervention.

Case VI (Figs. 652–655).—Several years ago this man, aged thirty-two, was injured in an automobile accident. In addition to the depressed fractures of the nasal bones the tissues over the dorsum of the nose were cut in several places with broken wind-shield glass. The intranasal structures were uninjured.

Operation.—The procedure employed in this case differs from that described in the preceding one in that the tunnel effected from the tip of the nose to the infraglabellar notch was made exactly in the midline of the nasal dorsum and not more than $\frac{1}{2}$ inch wide. A suitably shaped celluloid implant (Fig. 651, *c*) was then introduced into the pocket to correct the depressed nasal deformity, and the initial incision closed as in the preceding case.

Regardless of the prosthetic material employed for the correction of depressed nasal deformities, the columnar-hood incision has several distinct advantages, namely, forward or lateral displacement is prevented; the sutures are well removed from contact with the supporting material, and the slight scar, owing to its location, is almost invisible.

Comment.—There is a general, strong, deep-rooted prejudice

Fig. 652.

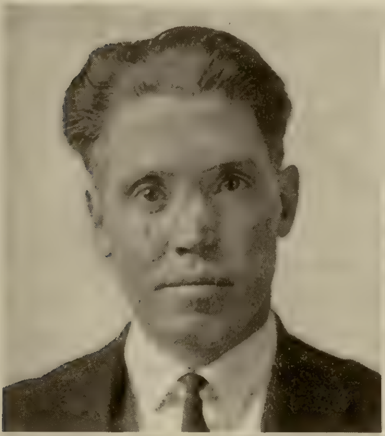
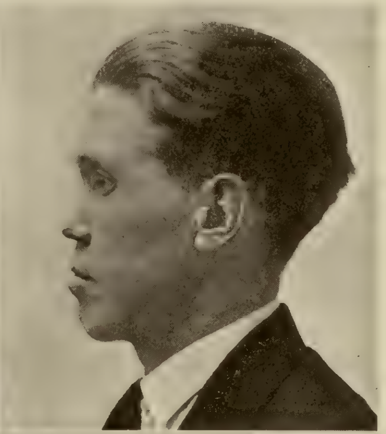


Fig. 653.



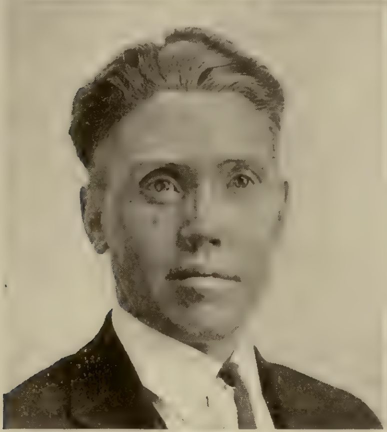


Fig. 654.

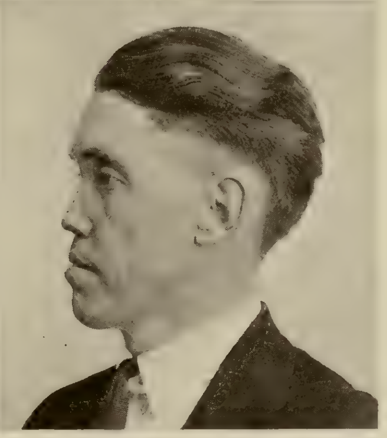


Fig. 655.

Figs. 652, 653.—Case VI. Preoperative appearance.
Figs. 654, 655.—Case VI. Postoperative result.

against the use of foreign substances as a supporting material for the relief of depressed nasal deformities, based on the knowledge gained from clinical experience, that they act as tissue irritants and sooner or later become extruded. In a wide sense this contention is well authenticated. But celluloid is the outstanding exception, for it has been conclusively proved by those who have used this material that it will remain indefinitely within the nasal tissues without causing any irritation and therefore does not become extruded.

Only those who have had no actual experience with the use of celluloid condemn the method, and therefore, the assumption that the idea is fundamentally unsound, rests wholly on the foreign body theory.

My own experience, based on a series of 25 cases in which celluloid implants have been employed for the correction of depressed nasal deformities, without a single extrusion, is striking proof that celluloid cannot with justice be included in the category of the tissue irritating foreign bodies. The implants have remained as introduced into the tissues over periods ranging from a few months to more than five years.

The manifold advantages of celluloid over paraffin, bone, and cartilage having been fully set forth in a previous article,[1] it suffices here to say that being perfectly convinced of the notable merits of the method, I venture the prediction that eventually it will be viewed as the ideal supporting material and supersede the methods now in vogue.

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[1] Depressed Nasal Deformities. A Comparison of the Prosthetic Values of Paraffin, Bone, Cartilage, and Celluloid; with Report of Cases Corrected with Celluloid Implants by the Author's Method, Annals of Otology, Rhinology, and Laryngology, June, 1923, vol. 32, No. 2.

CLINIC OF DR. ARCHA E. WILCOX

Minneapolis General Hospital

EQUIPMENT FOR THE STANDARDIZATION OF THE TREATMENT OF FRACTURES

The apparent increase in the number of traumatic cases admitted to the surgical service of the Minneapolis General Hospital is undoubtedly a fair criterion of the experience of institutions of a similar character in other rapidly growing municipalities. The preponderance of these cases is fractures of the long bones of the extremities.

As the work of this type has progressively increased on my service we have found it necessary to attempt at least to standardize, in a way, the treatment and the equipment utilized in the management of these cases.

Anyone who has had the responsibility of a large fracture service will appreciate the accompanying inconveniences and handicaps which usually exist where no definite system of treatment is in vogue, and where splints and apparatus are stored at some distance away in dark rooms, in disorder and confusion. Therefore, for the purpose of simplifying the management of these cases, to save time, and attempt to bring about better results I have devised the following equipment and system which is now in operation on my service at the Minneapolis General Hospital. While it is by no means perfect, it has proved a distinctly progressive step and convenience in the treatment of fracture cases.

The equipment consists of a fracture tool-truck, a set of three splints, fracture beds, and Balkan frames, and a room is provided directly off the fracture ward where truck, splints, and auxiliary apparatus are stored when not in use.

The truck, which is shown in Fig. 656, is made of angle iron and mounted upon heavy rubber-tired wheels which makes it practical to wheel anywhere in the ward and carries a set of splints, weights, rope, pulleys, set of tools, such as hammer, wrenches, coaptation appliances, felt, leather, rubber, adhesive plaster, mole-skin, towels, pins, etc. A vise is mounted on one end and this is useful in bending rods and rings to proper angles.

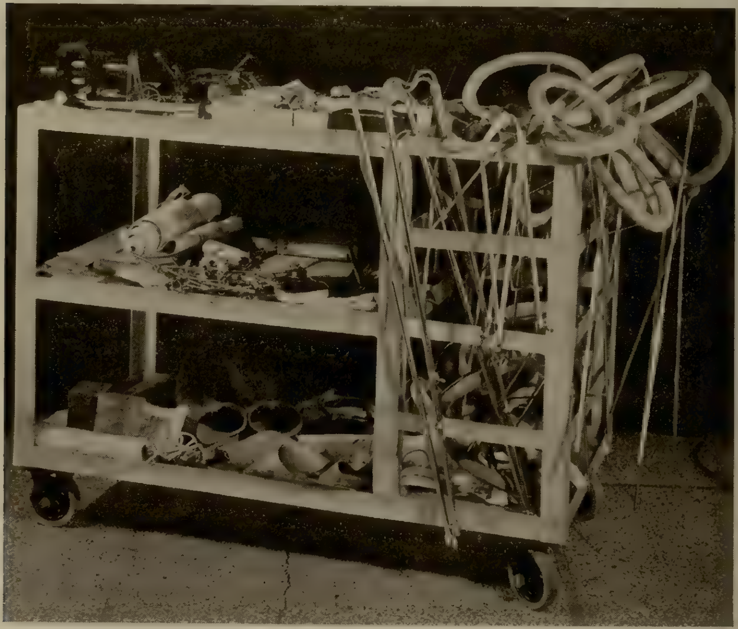

Fig. 656.

The splints referred to consist of three types which constitute a set and are designated as A, B, and C. (See Figs. 657–659.) As this is the original presentation of this equipment certain detailed description is deemed permissible.

The "A" splint is a modified Thomas-Williams splint, being adjustable as to length, and is, also, supplied with four different sized rings which can be used for the right or left limbs. It will be noted that the ring A^{10} is directly connected with two horizontal rods which are inserted into the long U bar A^8 which

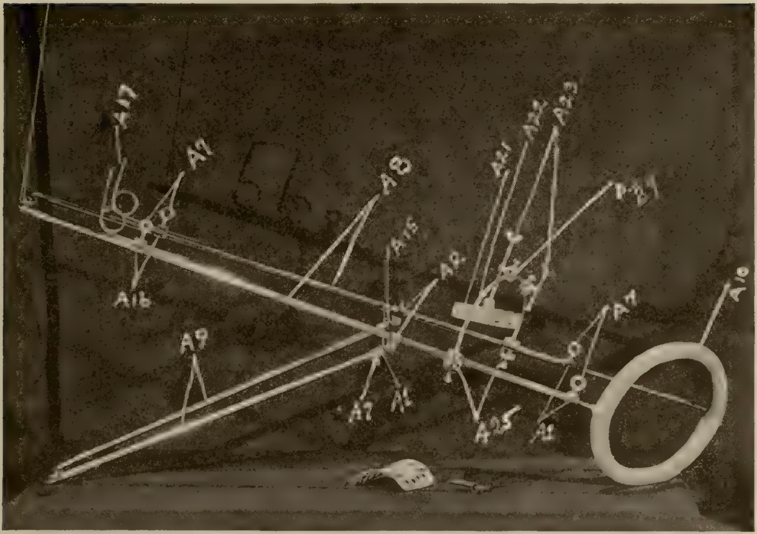

Fig. 657.—Model "A" leg splint: *A1*, Plain set collars; *A2*, set collar with hinge; *A7*, eye set-screws; *A8*, "U" slide tube; *A9*, "U" slide tube; *A10*, rings; *A15*, side swinging rods; *A22*, arch rod and nuts; *A23*, adjustable screw, ball, and wing nut; *A25*, bar, clamp, and screws; *A27*, adjustable screw, clamp, and screw; *A17*, foot spring.

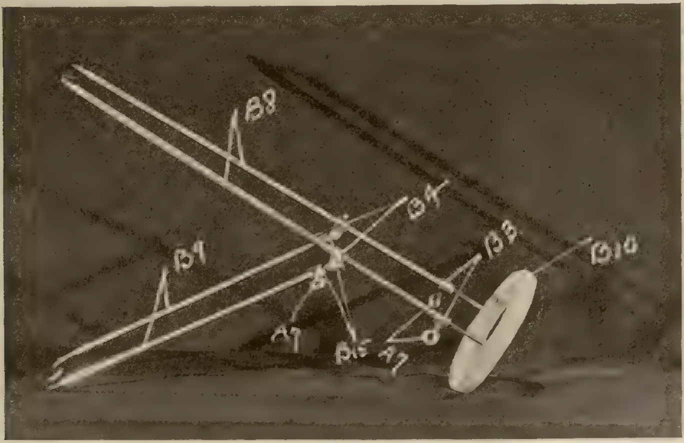

Fig. 658.—Model "B" leg and arm splint: *A7*, Eye set-screws; *B3*, plain set collar; *B4*, set collar with hinge; *B8*, "U" slide tube (long); *B9*, "U" slide tube (short); *B10*, ring and rods; *B15*, side swinging rods.

makes it possible to increase or decrease the length of the splint at will, and fixation of these rods is accomplished by set-screws A^7. The hinged collars which travel on the horizontal bars A^2 have rods attached which are inserted into the U bar A^9, making it possible to adjust this flexion bar at any position on the main splint, thus providing a readily adjustable apparatus for early motion of the knee in fractures of the femur. The foot-piece A^{17} is adjustable for any length of limb by the collars A^{16} and set-screws A^7, adjustment of these parts preventing toe-drop, still allowing exercise of the ankle-joint. The arched rod A^{22} is fixed to the parallel bars by set-screws and clamp A^{25} and can be moved longitudinally on the horizontal bars and provides a fixed point for the adjusting screw-ball and wing-nut A^{23} and the aluminum plate A^{21} where direct pressure is needed. This arched rod makes it possible, by adjusting the fixture A^{27}, to bring direct pressure in any diameter of the limb. The rings

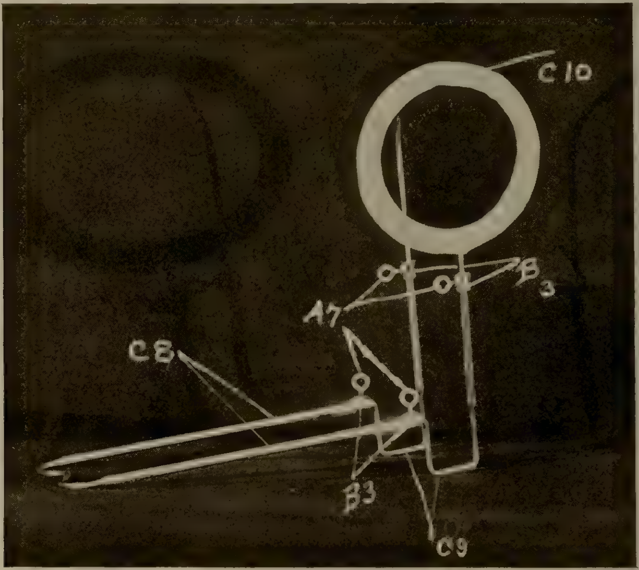

Fig. 659.—Model "C" arm splint: *A7*, Eye set-screws; *B3*, plain set collars; *C8*, "U" slide tube (forearm); *C10*, ring and rods; *C9*, sliding rod and tube (arm); *A21*, aluminum plate; *A16*, foot spring set collar.

of these splints are padded with felt covered with chamois, and the aluminum plate "A" containing only a small amount of copper makes it possible to take x-rays with the portable machine without interfering shadows.

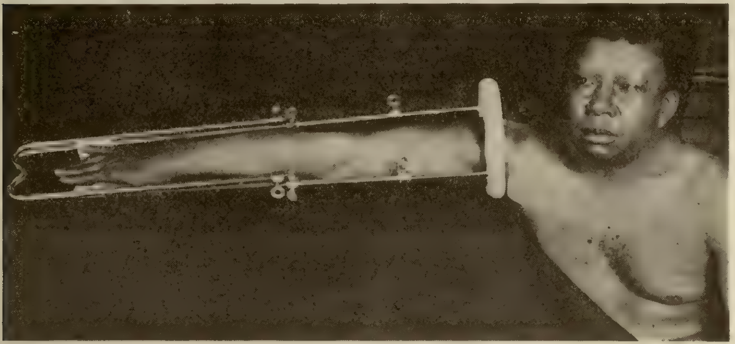

Fig. 660.

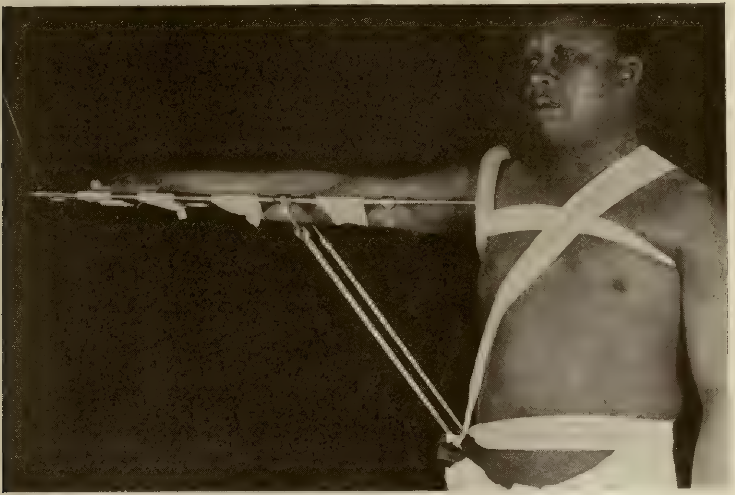

Fig. 661.

The "B" splint is a small "A" splint, and from the description of the latter the mechanical arrangement of "B" is obvious except

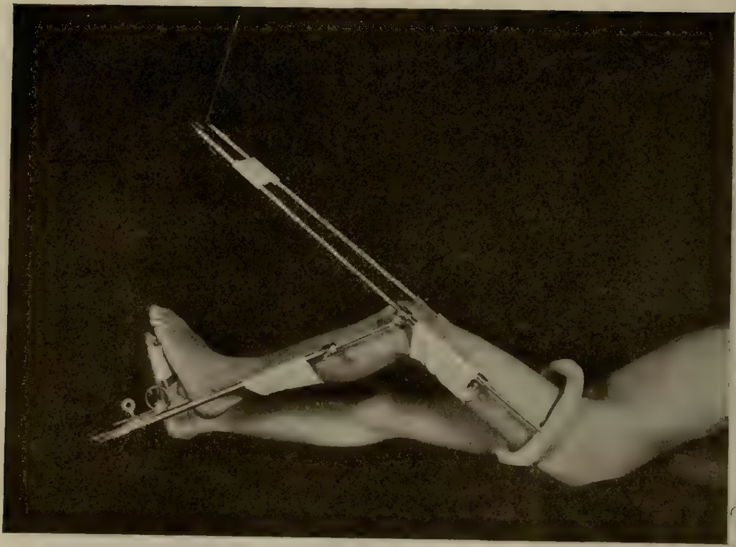

Fig 662.

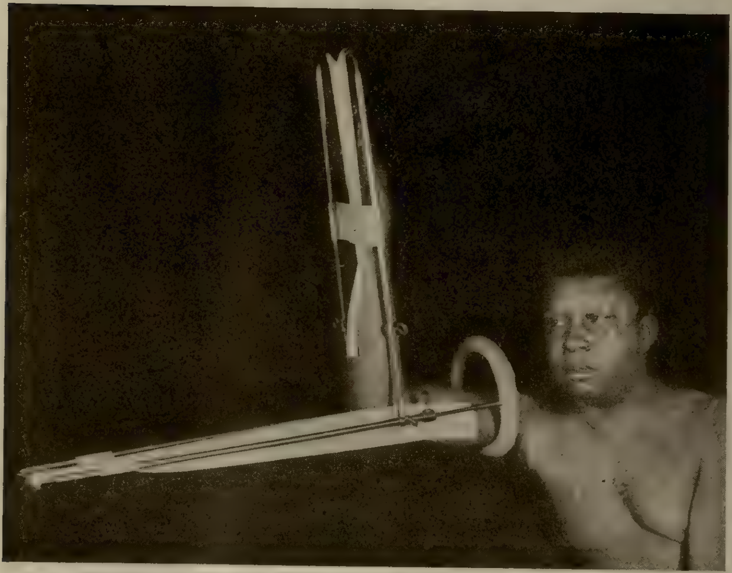

Fig. 663.

it will be noted in Fig. 660 the rings are at right angles to the rods which are inserted into the U bar B^8. The rings being at right angles, this splint may be used for:

1. Abduction treatment of fractures of the upper arm (Fig. 660).

2. As an aëroplane splint (Fig. 661).

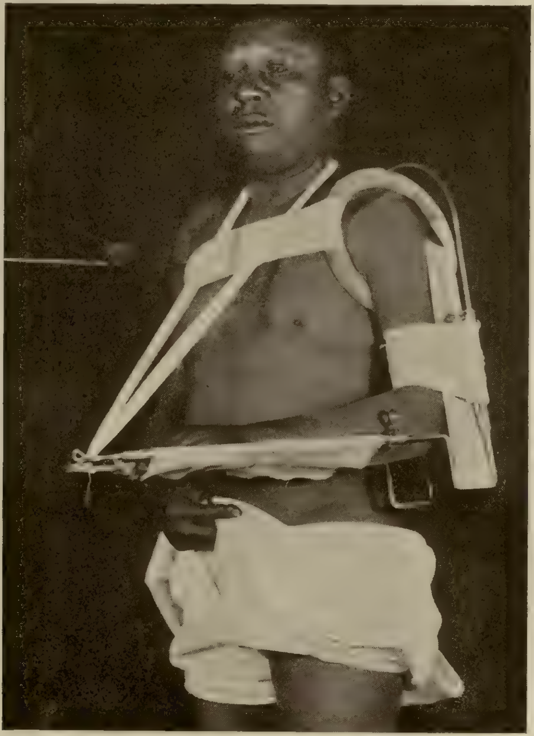

Fig. 664.

3. For fractures of the thigh or leg in children over six years of age (Fig. 662).

4. Fractures of the upper arm accompanied by injuries to the lower arm in which extension in two different directions is necessary. (Suggested in Fig. 663.)

This is an extremely useful splint, and many other combinations will suggest themselves to the operator. When using this splint upon the young adult as a leg splint it is necessary, after choosing the ring which fits the leg, to bend the bars connected with the ring to such an angle as may be appropriate to suit the groin of the patient.

It will be noted that the "A" splint rings are all made at an angle of 45 degrees to the horizontal bars, but it is frequently found necessary to change this angle, and these rods are easily bent.

The "C" splint is a modified Jones' splint (Fig. 664). It has four different sized rings, the same as the "A" and "B" splints, and is adjustable, as far as length is concerned, by adjusting the bars C^9 and C^8, fixation of same is accomplished by fastening with set-screws A^7. This allows for lengthening the bars for the forearm or arm, and by turning rings about the splint can be used on either the right or left arm.

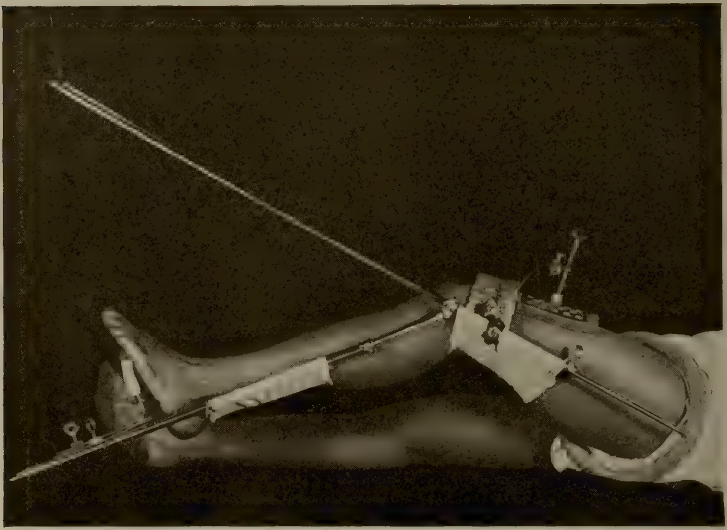

Fig. 665.

A suggestion of the use of this splint is shown in Fig. 664, and for splint "A" in Figs. 665, 666. None of these dressings are complete. They are only presented as suggestions as to the fundamental application of the splints.

Extension by calipers, adhesive plaster or pins, and the treatment by open or closed methods are not in any way interfered with by the use of this apparatus, and it has become our custom in operative cases to use these splints routinely rather than plaster casts. It has also been our custom when fracture cases are brought to the hospital, after first aid has been rendered and some definite idea as regards the course of treatment has been decided upon, to wheel our fracture-truck into the ward, select the ring which fits the patient and the parts to which it is to be applied, and then directly from the tool cart, or truck, to complete the dressing at one sitting, subsequently checking with *x*-ray and adjusting accordingly.

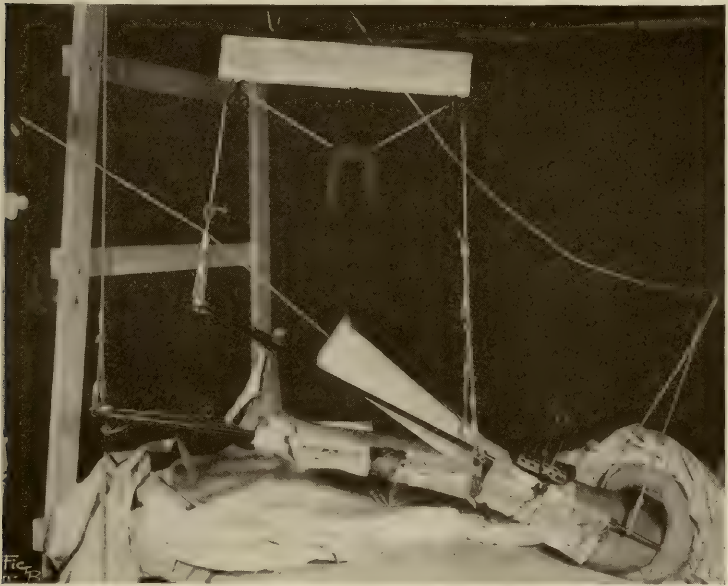

Fig. 666.

Since we have had sufficient apparatus of this type, and housed as suggested in the beginning of this article, the house-officers and interns have taken much more interest in fracture work. The results, I am sure, have been infinitely better, much time has been saved, and the co-operation of the patients in doing their part has become quite prominent. For instance, in early motion of the knee-joint in fractures of the thigh, pulleys and ropes are arranged to the flexion bars and the patient has helped to a great degree in early re-establishment of function in this joint which formerly has given so much trouble when allowed to remain too long in fixed apparatus.

FRACTURE OF RIGHT AND LEFT TIBIA AND FIBULA—LOWER THIRDS

The following case is reported on account of the difficulties in treatment:

This young lady, Miss J., eighteen years of age, was injured September 25, 1920. Her injuries consisted of a compound fracture of the right tibia and fibula, lower third; simple fracture of the left tibia and fibula, lower third. She was alighting from a street car and had reached the pavement when a motor-cycle traveling at a high rate of speed struck her, inflicting the above injuries.

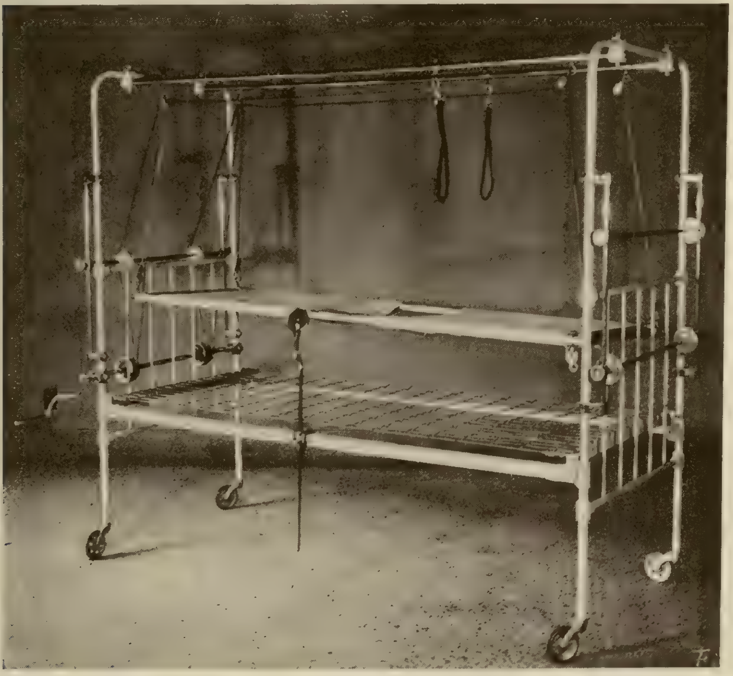

Fig. 667.

After repeated attempts at reduction of the fractures it seemed wise to consider them operative. The young lady's family, however, refused to have her operated and consequently we were compelled to use extension and fixation as a treatment of choice. Extension was accomplished by applying fairly heavy plaster casts, the malleoli, insteps, and heels being well padded with heavy saddler's felt. Extension was made directly through the casts, both limbs being slightly abducted. Patient was on a Bradford frame swung on the author's fracture bed, as illustrated in Fig. 667. In addition to the extension through the casts, which was carefully guarded, a large window was cut in the upper half of each cast and frequent adjustment of the fragments by lateral padding with felt within the casts was instituted.

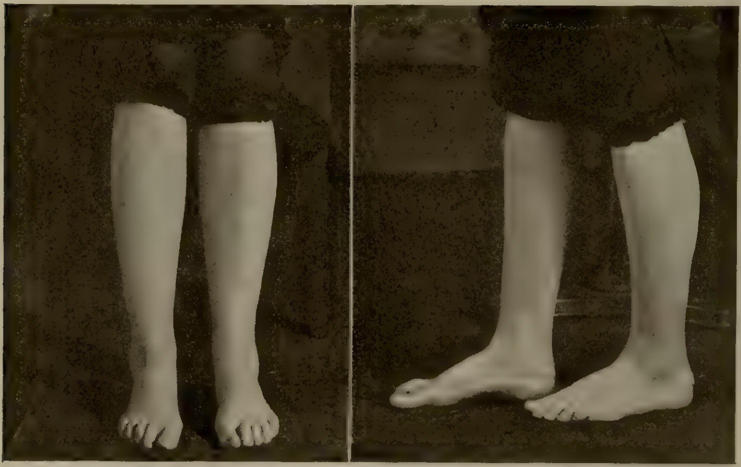

Fig. 668. Fig. 669.

Figs. 668, 669.—Illustrate case of Miss J. Fracture of both bones of both legs.

Good union took place in both fractures and the clinical result is well illustrated in Figs. 668, 669. The *x*-rays (Figs. 670, 671) show some overlapping of the right and left fibulæ, but the tibial alignment is excellent and functional result in this case is 100 per cent., patient having practically full restoration of function at the end of six months.

While I do not wish to enter into a discussion at this time upon the indications for operative procedures in fractures in the long bones, yet I think it is well to emphazise three points:

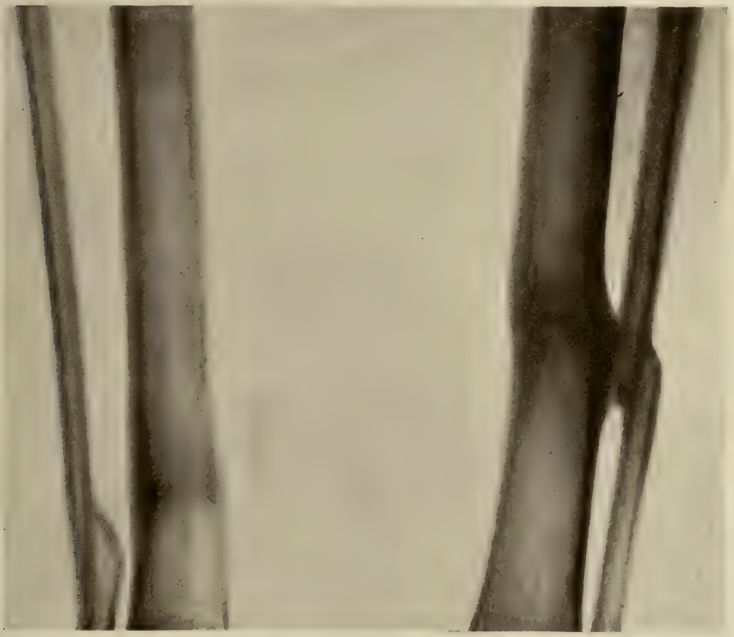

Fig. 670. Fig. 671.

Figs. 670, 671.—To illustrate case of Miss J. Fracture of both bones of both legs.

1. Every attempt must be made to reduce deformity in fractured bones by the closed method before operative procedures are thought of. This can only be accomplished by repeated *x*-ray pictures and conscientious effort on the part of the operator to utilize not only anatomic knowledge, but sufficient time in the effort to overcome deformity.

2. If, after conscientious and repeated efforts, it is found that the fragments of the fractures cannot be held in position, one is

justified, and it is his duty, to advise upon treatment with or without internal fixation as may seem advisable.

3. In general we believe the Lane plate is of the utmost value in the internal fixation of fractures of the femur, but practically confine its use to this area. In the tibia our first choice is internal reduction without fixation, and if fixation seems necessary our first choice is the beef-bone screw or Parham band. This, of course, all refers to acute fractures and not operative procedure for non-union.

However, in the case of Miss J., where operative procedures were advised but refused, the daily observation and adjustment of these limbs made possible the final clinical result, which, as stated, is now 100 per cent.

COMMINUTED COMPLICATED FRACTURE OF LOWER END OF LEFT HUMERUS WITH GREAT DISPLACEMENT OF THE FRAGMENTS; INVOLVEMENT OF ELBOW-JOINT

THE following case is presented as it is a typical case of severe injury of the humerus and elbow-joint and represents the type which is apt to cause considerable permanent deformity, limitation of motion, and dissatisfaction.

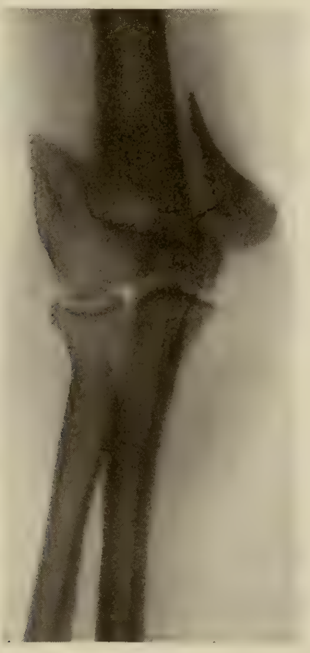

Fig. 672.—Comminuted fracture of lower end of left humerus.

Mr. P., a young man, was injured in April, 1920, injury being caused by gloved hand catching in the crank of a cable reel, the unwinding of which twisted the arm and threw him to the ground, causing above described injury.

In the treatment of these cases in the adult repeated efforts are necessary before the fragments can be satisfactorily replaced, and in many instances replacement is impossible and every succeeding *x*-ray picture seems to look worse than the preceding one. In fact, these fractures are extremely discouraging from the *x*-ray point of view whatever may be the end-result.

In treating these complicated fractures of the lower end of the humerus the fundamental principles must be rigidly adhered to. That is, the reduction of fragments, fixation of same, and early mobilization of the joint.

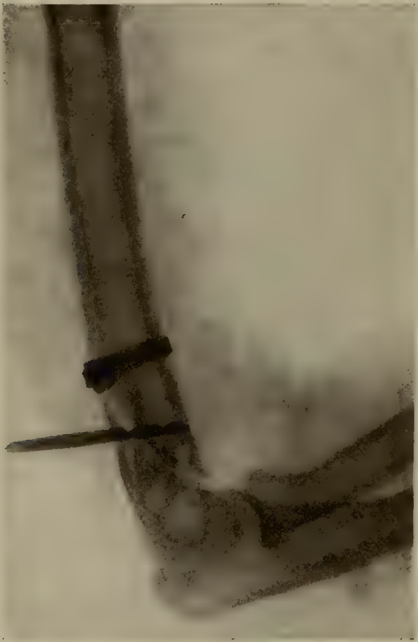

Fig. 673.—Comminuted fracture of lower end of left humerus.

In this particular case repeated efforts were made to mold these fragments into place, but our efforts were futile and the deformity still remained the same from first to last, as shown in *x*-ray (Fig. 672). The shaft of the humerus had been driven down between the two fragments, represented by the external and internal condyle, not only tipping them backward, but separating them as well and causing an acute angulation of their articulating surfaces. Operative procedure was, in our opinion, clearly indicated in this case, and on April 8, 1920 we operated upon the outer condyle and, after replacing the fragment, held it in position with a Parham hand and bone-drill which was left *in situ*. It seemed advisable, also, to use a bone-screw, and one was inserted through the condyle of the shaft as shown in Fig. 673. Subsequent x-rays showed the inner condyle markedly displaced, and a secondary operation was made April 21, 1920, at which time this condyle was fastened to the shaft in fairly good position and held in position by bone-screw. Unfortunately the x-ray showing the anterior view of this has been misplaced. Early passive motion was instituted in this case and ultimately a very satisfactory x-ray picture was obtained, as shown in Fig. 674; limitations of flexion and extension are well illustrated in Fig. 675.

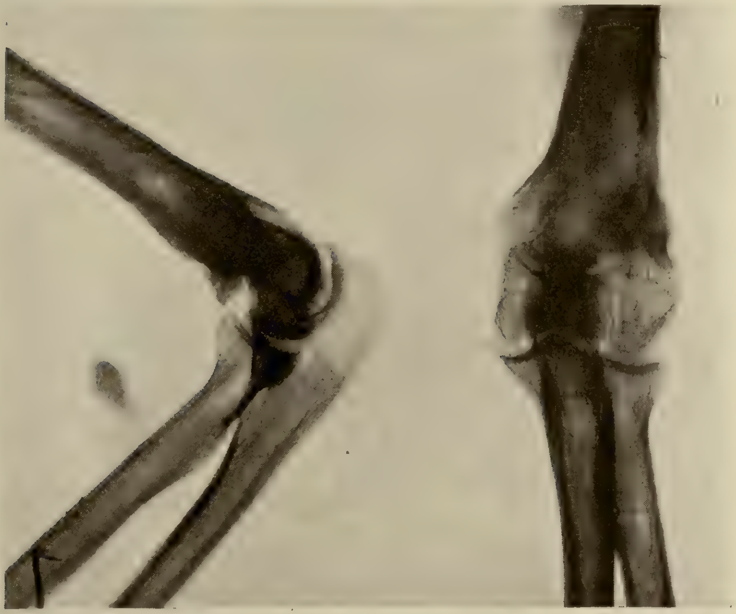

Fig. 674.—Comminuted fracture of lower end of humerus.

I believe this case demonstrated the necessity of courageously approaching complicated fractures near a joint by the operative

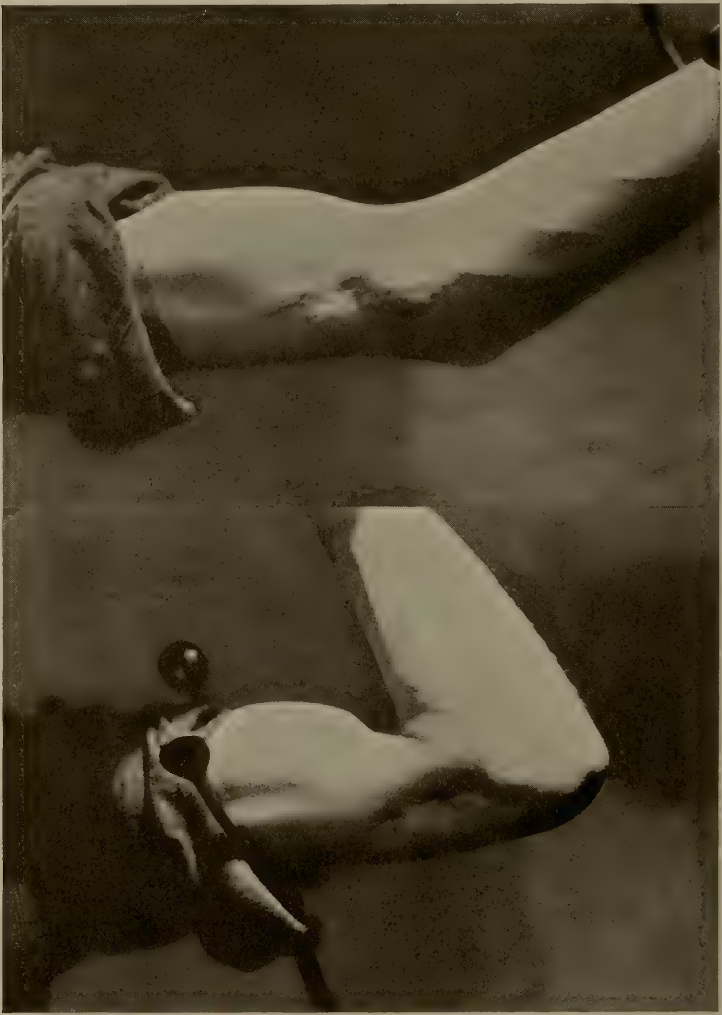

Fig. 675.

method. If one is satisfied to accept the belief that these fractures are bound to cause limitation of motion, always have done so, and always will do so, too much responsibility is imposed upon nature, and the result will always be bad. Therefore I feel operative interference is not only logical, but is indicated, and irrespective of the fact that with operative treatment some bad results are obtained, nevertheless many cases will be improved and our experience justifies the grounds for instituting these operative procedures.

This patient at the present time has a very useful arm, and although he had some involvement of the ulnar nerve for a time, manifested by abnormal sensation and interosseous atrophy, this has entirely subsided. Our notes also show he had some intermittent discharge from sinuses after removing the drill, which necessitated removal of the Parham band and curetment and removal of the bone-screws, which evidently became infected. However, sinuses healed completely and no unpleasant complications have occurred.

CLINIC OF DR. ARNOLD SCHWYZER

St. Joseph's Hospital, St. Paul

A NEW PYELO-URETERAL PLASTIC FOR HYDRONEPHROSIS

Ever since Fenger's publication in 1894 pyelo-ureteral plastic operations for hydronephrosis due to pyelo-ureteral strictures or kinks are accepted forms of treatment. In 1886 Trendelenburg made the first and very simple plastic (according to Kummell, in "Chirurgische Operationslehre," by Bier, Braun, and Kummell, 1920). Trendelenburg opened the hydronephrotic sac widely and divided the spur which was formed by the parallel course of the ureter with the wall of the renal pelvis. The pelvis and ureter were split down to the point where the ureter left the pelvic sac. The mucosæ of the pelvis and ureter were then united by catgut.

Fenger split the pyelo-ureteral stricture after the Heineke-Mikulicz principle for pyloric strictures, and united the upper and lower ends of the incision by suture, thus transforming the longitudinal incision into a transverse union. Both methods have been crowned by results in the hands of different operators.

The anatomic configuration at the pyelo-ureteral junction may vary a great deal. At times an abnormal vessel was found to be the cause of the kink, and was therefore divided. Each case has its individuality, and the form of plasty is thus probably best conceived and decided upon when the peculiarities are recognized. Morris advised an operation practically identical with the procedure of Trendelenburg except that the pelvis is not opened so widely and the suture is not done through this opening in the pelvis. Kuester's method is adapted for cases where the stricture is a few centimeters below the pelvis. He ties the ureter near its emergence from the hydroephrotic sac and resects the ureter to below the stricture. He then splits the end of the ureter for 1½ cm. downward and implants this into the lower pole of the pelvis. Krogius advises to implant the split ureter into an opening made by a triangular excision at the lowest point of the sac. Albarran advised a lateral anastomosis between pelvis and ureter below the stricture. A ureteral catheter may be inserted from the convexity of the kidney, emerging at the opening in the pelvis and entering the ureter again at the site selected for the anastomosis. This avoids constriction during suture and favors a proper relation of the parts during healing.

I only want to speak of the plastic methods for stenosis at the pyelo-ureteral junction, and therefore will only mention, without further discussion, other ways of attack, like nephropexy in case of floating kidney, nephrostomy, pyelostomy, pyeloplication or resection of the hydronephrotic sac, anastomosis between the hydronephrotic sac and the bladder and finally nephrectomy.

Of the plastic operations without complete division of the ureter from the pelvis, all three operations mentioned (Trendelenburg, Fenger, and Morris) are nothing else than a linear division of the stricture with the one end of the incision in the kidney pelvis and the other in the ureter below the stricture. The results of some of the foremost surgeons have not been very good with these methods, and we read that, as a rule, the plastic operations are not very successful. This is my excuse for offering a different method, though I only had the chance to try it in 3 cases. It is different in one essential point, in that we try to avoid the difficulty one encounters in linear division. In this latter, with the transverse suture of the longitudinal incision, there exists always the tendency to the formation of a valve-like fold from the part of the wall opposite to the suture. There occurs, according to the sketches in some of the publications, a good deal of puckering at the site of the new pyelo-ureteral union.

The method which I submit for your consideration is readily understood from the sketches which accompany the case reports.

Case I.—Miss M. R., aged twenty-one, entered St. Joseph's hospital on February 10, 1916, with the diagnosis of appendicitis. She had had vague attacks of abdominal pain since she was nine years old. She had four attacks of "appendicitis" since the first of the year. There was tenderness over McBurney's point. Appendectomy February 11, 1916 demonstrated moderate old inflammatory changes. On February 17th she complained of vague pain in the right lumbar region while she was sitting up. On palpation the area was bulging and rather tense. The pain became severe and the diagnosis of hydronephrosis was made. The urine was somewhat turbid; the temperature, which had stayed below 99° F., went up to 100° F. and the patient vomited. On the following morning we withdrew by ureteral catheter 16 ounces of turbid urine from the kidney pelvis. This brought great relief. On February 21st we made the note that the urine after standing twenty-four hours contained about 20 per cent. by bulk of thick pus. It is worth while remembering this, as it shows that even with this much infection conservative surgery is permissible. The temperature came down to between 98° and 99° F. There was less tenderness, and the tenseness in the right side was greatly diminished. On February 25th the resistence was again harder, reaching with its pole to 2 cm. below the navel line. For two days this filling

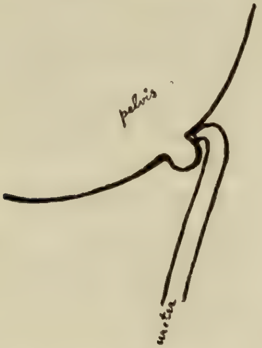

Fig. 676.—Case I. Small diverticulum of renal pelvis with strictured ureteral opening in its roof. Sharp kink of ureter.

had gradually recurred with diminished pus in the urine. On February 28th a pyelo-ureteral plastic was made.

The kidney was found distended to the size of a newborn baby's head. The pelvis was incised. A diverticulum the size of a pea was noticed and in its roof the ureteral opening was found. It was greatly stricture. After freeing the parts the course of the upper end of the ureter became considerably more straight. A Y-shaped incision was now made with its center about $\frac{1}{2}$ cm. above the ureteral opening. From here one leg ran downward into the ureter, which it split for a distance of about 1 cm. The two other legs of the incision ran upward into the hydronephrotic sac with an angle of about 60 degrees between them. Each of the three branches of the incision was about $1\frac{1}{2}$ cm long. The tip of the triangular flap in the kidney pelvis was united by catgut with the lower end of the slit in the ureter, avoiding the mucosa. On each side sutures approximated the cut edges in such manner that the folds, which always must occur, were well up in the wide portion of the pelvis, while at the ureter junction the parts were smooth. The upper end of the ureter thus became funnel shaped. Two catheters were now inserted from the convexity of the kidney, one into the ureter, the other only into the pelvic sac. The former was removed after two days, the one in the kidney pelvis after three. On March 25th the patient left the hospital in good condition. The urine rapidly cleared and has remained normal ever since. Upon inquiry in November, 1922 the patient wrote that she is in perfect health, and has been so since she left the hospital in the spring of 1916.

Case II.—Mrs. C. L. K., mother of 4 children, entered the hospital on February 21, 1919. She had been operated upon six years previously elsewhere for stone in the left kidney. Two weeks after the operation similar pain returned, and kept on until two years later she was again operated upon. Some abnormal blood-vessels were found at the renal pelvis, and these—we are told—were divided. One month after this second operation the old pain reappeared. A steady dull ache in the kidney area alternated with frequent attacks of severe colicky pains and vomiting at intervals of from two days to two weeks.

On February 25, 1919 we cut down upon the kidney, found it of good size, with moderate dilatation of the pelvis, which was divided into two channels. Both pelves ended in narrowing outlets to join the unusually small ureter, which was of a size hardly larger than an ordinary parlor match. The upper pelvic outlet was kinked and somewhat doubled up on itself. Though the case was not very promising on account of old fibrous changes and the narrowness of the ureter, we made the flap plastic. The patient left the hospital four weeks after the operation with the wound healed up to a superficial area. She was free from pain. I am informed that later on, from time to time, the patient had pains from which she was relieved by morphin. In March, 1920 she was operated upon for ruptured ectopic gestation and died. This case had not appeared very suitable for the flap operation, but the kidney was large and looked healthy, and we did not want to sacrifice it without trying a plastic.

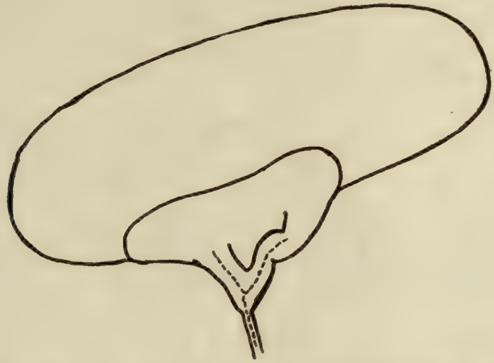

Fig. 677.—Case II. Bifid pelvis, moderate distention of pelvis; exceedingly narrow ureter. Some stricture of pyelo-ureteral junction. Kinked course of upper branch of pelvis. Y-shaped incision indicated by dotted line.

Case III.—A girl of seven years entered the hospital on June 17, 1919. She was brought in as an emergency case, suffering severely from pain in the left kidney region. The temperature was 99½° F. There was pus in the urine microscopically, though it appeared not markedly turbid. A large tumor three times the size of a man's fist in the kidney region was easily felt. The diagnosis was acute uronephrosis. Operation took place on that same day. The origin of the ureter was again—as in the first reported case—forming a sharp S-shaped curve. This was straightened out by freeing the ureter and a flap plastic was done. The temperature remained elevated for three weeks, at times reaching 102° F. The wound needed much irrigating and care, but the patient left the hospital in good condition with the wound practically healed on July 14th, four weeks after the operation. A report from the patient's father, received in November, 1922, declares that the girl is in good health. Only when she catches cold does she have some pain in the kidneys. Before the operation she used to get a spell every eight or ten days.

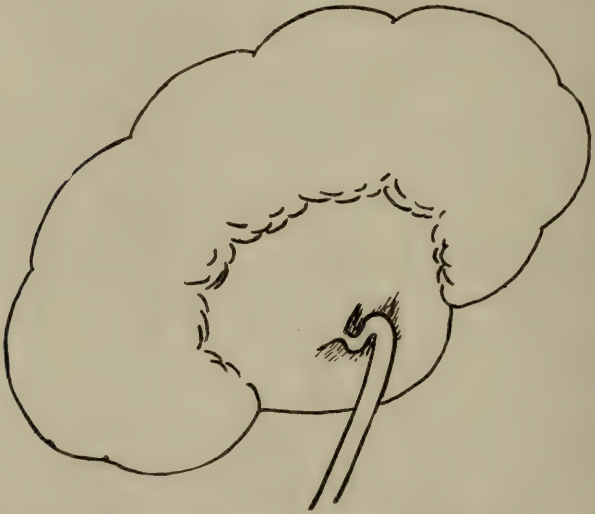

Fig. 678.—Case III. Hydronephrosis in girl of seven years. Stricture of uppermost part of ureter with kink, held firmly against pelvis by fibrous bands.

The essential points of the method used in these cases are:

First, that the mucosa is not sutured, but brought into exact apposition. This reduces the danger of formation of concretions. Second, at the junction of the pelvis with the ureter the parts are in linear approximation. In the Fenger operation, which follows the pyloroplasty principle, the parts have a great tendency to puckering and to separation after the catgut has given away. Unless, however, the two ends of the linear incision remain in good apposition there occurs a fistula with irregular wound healing. Third, and more important, the slack and fold which is unavoidably produced by sliding the flap downward to the end of the slit in the ureter is taken care of at the upper end of the pelvic incisions, and the ureteropelvic junction does neither become kinked nor puckered.

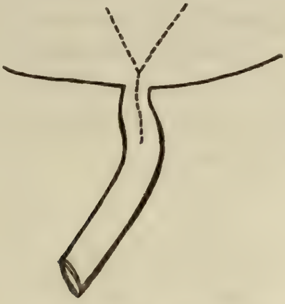

Fig. 679.—Case III. Kink in ureter freed. Y-shaped incision indicated.

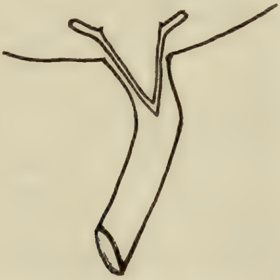

Fig. 680.—Case III. Pelvis flap pulled down to lower end of split ureter. Slack of outer wound edge taken up at upper angles.

Cases I and III were closely related in their anatomic pathology, *i. e.*, in the strictured and sharply kinked ureteral opening. Both were combined with a certain degree of infection, the first one showing a large deposit of pus in the urine, the second having considerable rise of temperature. Nevertheless both are now in good health, six and a half and three and a half years after the operation. It is therefore permissible to try conservative measures in hydronephrosis even in the face of a moderate infection, provided this infection has not brought on marked and lasting anatomic changes.

CASE REPORTS. INTRODUCTORY REMARK

In the following pages we report a number of clinical cases in which the history has often been shortened to avoid bulk. In most of these the only reason for their presentation is one or two interesting or unusual features. We may have dwelled longer than necessary upon some points which seemed instructive. I am afraid the selection of the material—which represents simply a few lucky results—betrays perhaps too large a measure of enthusiasm. But a surgeon needs some of this to help him over the dark days which come from time to time to every one of us.

All the reported cases were treated at St. Joseph's Hospital.

The sketches were practically all made by the writer directly after the operation or after examination. They are, therefore, very primitive in appearance. The gorgeously beautiful and elaborate pictures, lavishly proffered in our present-day journals, are of course a fine feature when they are not used to cover up a meagerness in other respects. They are, however, not absolutely necessary in many instances, and should not come to be considered a necessity.

A CASE OF SO-CALLED CRYPTOGENETIC SEPSIS

A patient was brought to me as a cryptogenetic sepsis with the severest chills I have ever observed and with temperatures of over 106° F. I shall report the case as it unrolled itself before us. Though this experience dates back ten years it seemed of enough interest to report it here.

It was a man whose previous history was very good. He was of robust build and of good state of nutrition, though somewhat pale. He had never been sick until one evening (January 24th) he was taken with a chill lasting about twenty minutes. The temperature was not taken. In the night of January 25th he had another severe chill. There was no pain anywhere. On

January 27th the fever was measured for the first time. It ranged from 101.4° F. in the forenoon to 103.6° F. in the afternoon. On January 28th and 29th he again had a chill each day, but his temperature was not taken except in the mornings before the chills when it was nearly normal. For three successive days he was then free from fever and chills. On February 2d he experienced a tremendous chill and the temperature shot up to 105.6° F. The patient was then hurried to St. Paul, where he arrived in the hospital at 2 P. M. on February 3d. His temperature was then normal, but within an hour a formidable chill overtook him and the temperature rose to 106.4° F. (per rectum). Pulse 144. The patient vomited. Our examination revealed very little. There was a trace of jaundice. The abdomen was somewhat large, but the patient declared it was normally so. The region of the gall-bladder was a little tender, though not distinctly. Much as we tried to get some clue, the patient remembered nothing abnormal about himself. On questioning, he thought he had had, about three weeks previously, a slight secretion from the urethra for a few days, harmless, however, in appearance and symptoms. The patient, a very straightforward man and anxious to help us as he felt the imminent

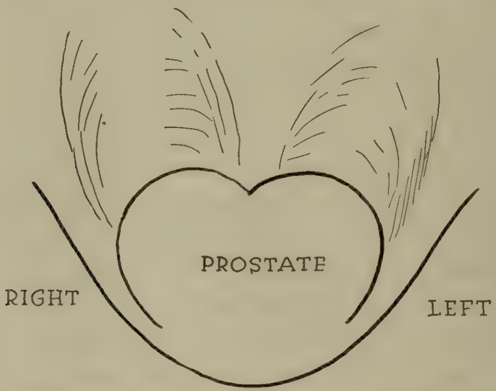

Fig. 681.—Sketch made February 3, 1913. Findings by rectal examination: "Region behind prostate on right side is tender, though not very definitely. It is more globular than on left side, also more bulky, though even the left side seems rather bulkier than normally."

danger for his life, was positive that he had really always been in excellent health.

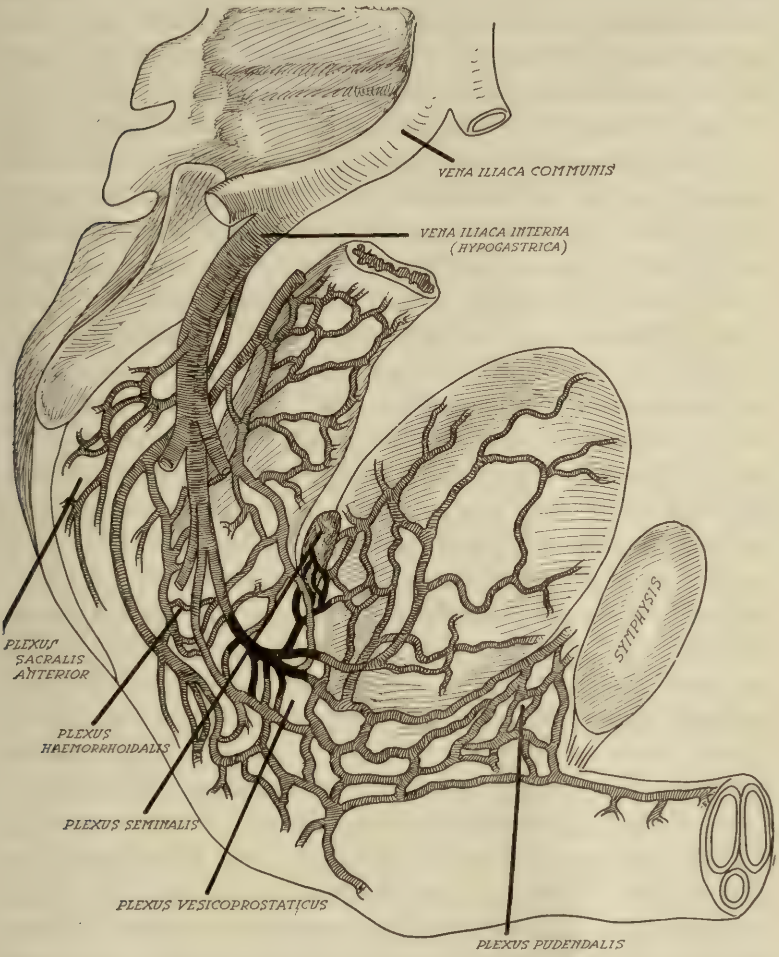

Fig. 682.—Venous plexuses in male pelvis, arranged from several treatises on anatomy to show the location of the thrombosis, which is indicated by the black marking in the vesicoprostatic and the seminal plexus.

We examined per rectum. Two other physicians had negative rectal findings. It seemed, however, that back of the prostate, which was of about normal size, the region of the seminal vesicles was a little bulkier than normal, especially on the right side. These findings were not so that one could be entirely positive, but I made a note of the fact that on palpation there was some tenderness on the right side behind the prostate in that somewhat rounded area which I took to be a thickening in the posterior part of the periprostatic plexus.

As the condition was apparently a very critical one, and as the patient was anxious to have anything tried, I opened his abdomen on the following morning (February 4th) for further investigation, and in the hope of finding some definite pathology. It was, of course, evident from the chills and the temperature that we were dealing with a thrombophlebitic sepsis.

A median incision allowed us to investigate the pelvis, but I had hoped to find at least some fibrinous deposit at the site of the supposed subperitoneal infection. Nothing, however, could be seen. The region of the right seminal vesicle seemed a little bulkier than the left. We decided—especially on account of the pain which had been noticed at the rectal examination—to ligate the internal iliac (hypogastric) vein. Some experience in surgical treatment of thrombophlebitic puerperal sepsis made us decide upon this procedure. The vein was ligated near its entrance into the common iliac. No thrombosis could be palpated along the distal portion of the vein. The upper abdomen was now explored. The gall-bladder was tense and a small stone could be felt. Through a 2-inch incision upon the inserted fingers the gall-bladder was pulled out, the stone removed, and a drain fastened into it water-tight.

Right after the operation the patient was in very good condition. For a whole week the temperature (rectal) ranged between 98° and 101° F. No chill or any unfavorable symptoms. We were satisfied that the apparent "cryptogenetic" sepsis had originated from the peripheral portions of the internal iliac vein, or more specifically from the prostatic or seminal plexus on the right side. We figured that we had a prostatic infection of some kind of which the previous urethral discharge was an indication, and that an extensive septic thrombosis in the periprostatic plexus had occurred with repeated discharge of septic material into the general circulation, as demonstrated by the chills. We explained to the patient that we were not entirely safe against renewed chills, as there was danger of progressive thrombosis over to the other side or backward toward the hemorrhoidal plexus. The possibility of having to ligate on the other side was mentioned. Sure enough, after seven and a half days, on the evening of February 11th a chill came on. The patient vomited twice and the temperature shot up to 105$\frac{2}{5}$° F. Another chill occurred on February 13th, and again on the following day, each time with high temperature and vomiting. February 15th passed without a chill, though the temperature rose to 104° F. On the next day it only went to 102° F. All this time, while preparing autogenous vaccine from blood-cultures, we hoped for a localization of the process.

Finally, on February 18th, a distinct thickening was felt in the posterior prostatic region. Urination became painful. A perineal incision, carried well upward and backward, yielded 20 to 30 c.c. of creamy pus. On February 26th the patient left the hospital feeling well. We saw him again two years later; he was the picture of health and had been well ever since leaving the hospital, with the exception of an attack of pain in the gall-bladder area lasting one day.

No doubt the ligation of the internal iliac vein had checked the thrombophlebite sepsis long enough for the formation of an abscess of discoverable size.

The meagerness of the local symptoms as compared with the severe general septic picture gives the case its diagnostic interest. Would a primary perineal approach have been better? Would the patient have stood the mechanical trauma of such an approach? Would the danger of dislodging septic thrombi not have been too great? The pathology only gradually revealed itself. But it became clear, finally, as the case progressed with the exception of the original cause, which remained a mystery, until about six weeks after the discharge of the patient his wife was brought to the hospital in a serious septic condition.

Three weeks after our patient had gone home she started with severe pain in the lower abdomen, marked tenderness on palpation, a temperature ranging from 100° to 102° F., headache, chilly feeling, and intense pain at defecation and urination. She had been married eighteen years, had neither children nor miscarriages. Four months after marriage she had an attack similar to the present. It had kept her in bed six months. Since then she had had attacks at different times. A profuse leukorrhea dates back to the first attack. The husband now only remembers (!) having had a gonorrhea before marriage. A pyosalpinx with foul-smelling pus was at the bottom of this. Thus after eighteen years the wife paid her diplococcic infection back in the currency of a secondary pyogenic mixture.

DIVERTICULITIS OF SIGMOID DISCHARGING CONCRETIONS INTO URINARY BLADDER

Miss K. McG., fifty-one years old, gave the following history on December 15, 1921: Six years ago she had a fever for two weeks, which had been declared to be typhoid. Since one year she passes stones with the urine. Sometimes a soft mass comes. When this soft material does not appear for two or three weeks, then stones come. She showed us a paper box full of "stones" of irregular shape and of the average size of cherry stones. Some others were 2 cm. long and 6 or 7 mm. in diameter. They were not very hard and could be broken with moderate force by the fingers. The onset of this condition a year ago was acute. The patient was in great agony for four days. Then a stone was passed and with this she was better. Such stones were passed on an average of one a month. Sometimes she passes two stones in one attack. On December 15th she passed the last one.

The examination in the office yielded no positive findings. Chest and abdomen negative except some moderate tenderness on pressure low down in the abdomen. Virgo intacta. Hymen very narrow; urethra somewhat dilated. In front of the uterus a rather indistinct resistance is felt. Washing of the bladder yielded brownish smeary material which smelled fecal. Cystoscopically we found above the right ureteral opening a dark hole, partly covered by a little knob, like a sentinel pile. The mucosa

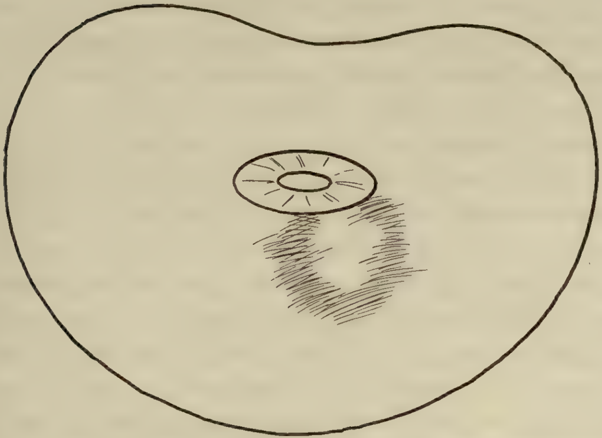

Fig. 683.—Palpatory findings before operation. The vague thickening in front of the uterus is on the left side of the median line, while the opening in the bladder was above the right ureteral orifice, and the fistulous tract ran into the left side of the rectosigmoid. The diverticulum must have laid across the gut with its distal end near the right side of the bladder. Later inflammation and shrinking probably pulled this portion of the bladder over to the left.

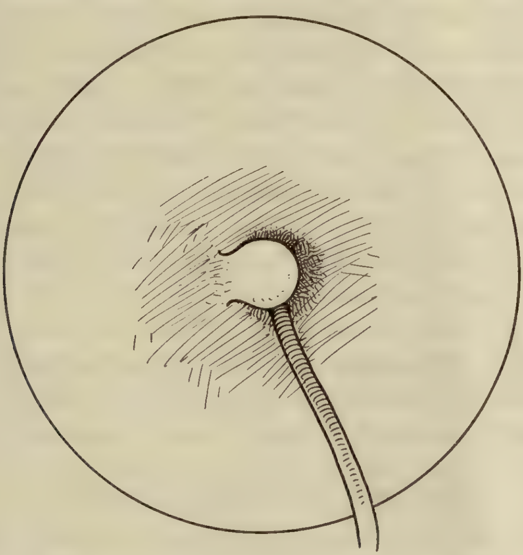

Fig. 684.—Hole in the bladder with ureteral catheter inserted. A knob of tissue partly covers the opening.

of the trigone was very edematous. Observation in the hospital; Mineral oil was given; no stones were passed the next few days, but every day smeary masses pass with the urine each time the bowels move. The urine is pretty clear except after the bowels have moved. *x*-Ray pictures gave no definite information.

It was clear that we had a communication with the intestine. The hardness of the masses passed told us that it was the large intestine. The wide hole found in the bladder, with only little discharge of fecal material and only at rather infrequent intervals, showed that we had no direct communication, but rather a narrow fistulous channel, narrow at least in one part of its tract. The diagnosis was made of a diverticulitis of the lower colon, probably sigmoid, with the formation of concretions and a fistulous opening into the bladder.

On January 12, 1922 median laparotomy; steep Trendelenburg position. A hard mass in the vesico-uterine space is laid bare. It is gradually freed, following down along the bladder wall. The fistulous channel is nicely recognized and excised. The sigmoid at its junction with the colon pelvinum shows an opening of the size of a lead pencil on its *left* side. Suture of colon and of bladder. The omentum was tucked down between the two sutured surfaces. Drains to right and left at some distance. The postoperative course showed nothing in particular. Patient discharged February 3, 1922.

On February 9, 1923 the note was made: "Pelvis good, no resistances. Urine clear. Patient holds the urine all night unless there is very much urine. Small hernia at lower angle of wound, where the drains were."

The interest of this case lies in the indirectness of the sigmoideovesical fistula through the intermediary of a diverticulum, which caused fecal material to remain long in the tract and thus to form hard masses which were passed at intervals as vesical calculi.

CARCINOMA OF BASE OF TONGUE

Mr. F. S. B., civil engineer, fifty-five years old, came to us on May 28, 1920 for difficulty in swallowing. He was referred by Dr. A. W. Hilger, laryngologist, who had found a mass at the base of the tongue. A small piece had been removed by him for microscopic examination and had proved to be carcinoma.

The onset of the symptoms occurred in January, 1920, with difficulty in swallowing solid food. This was at times more, at others less pronounced, but kept on bothering him, though he hardly felt any worse generally. At times of late there was some blood in the saliva. The general condition was good. Further details need not be mentioned; the patient had always been robust. At the base of the tongue, directly in front of the epiglottis, there could be felt a rounded tumor the size of a small walnut or large cherry, of rather regular shape, of moderately soft consistency and projecting upward. The tumor was smaller toward its base, but was sessile. The two sketches show how the tumor appeared. There were enlarged cervical glands on both sides.

It was decided to do the operation in two stages and to make a block dissection of the gland carrying areas on both sides first. This was done on June 1, 1920. Incision was made from one mastoid process to the other with two lateral vertical incisions downward. Both submaxillary glands, both lower poles of the parotids, and the lymph-glands over the internal jugular vein were removed in one piece. Both lingual and hypoglossal nerves were dissected free.

Microscopic examination: Sections were made from four blocks of neck glands and later from the lingual tumor. On the left side we found no malignancy in the two blocks examined, while on the right side the glands were invaded by the carcinoma. The cells were very irregular in size and showed numerous mitotic figures, the same as in the main tumor. Dr. Bell, Professor of Pathology at the University of Minnesota, had the kindness to examine the sections recently and gave the following report: "The tumor from the tongue of Mr. B. is a highly malignant growth with metastases in one of the lymph-nodes. There are eight or ten mitoses in each high-power field. There is no cornification, but the arrangement in solid cords indicates an epithelial tumor. Probably a squamous-cell carcinoma (non-cornified), very malignant."

Ten days later the primary carcinoma was removed. Through the old incision, which was, however, curved toward the chin in front, we entered into the depth on the right side. The digastric tendon had to be divided after the stylohyoid and styloglossus muscles were cut. They all presented a granulating surface and infiltration from the dissection ten days previously. The mucosa of the mouth was then opened. The granulating condition of the different tissues of the partly drained wound was now a very welcome protection against the infection from the mouth. The palate, pharynx, epiglottis, and tongue could be freely seen. We recognized that the tumor could be excised in apparently healthy tissue. It was located in the midline immediately in front of the epiglottis, too far back to make a

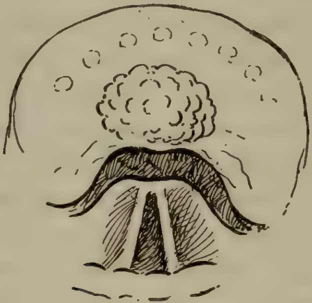

Fig. 685.

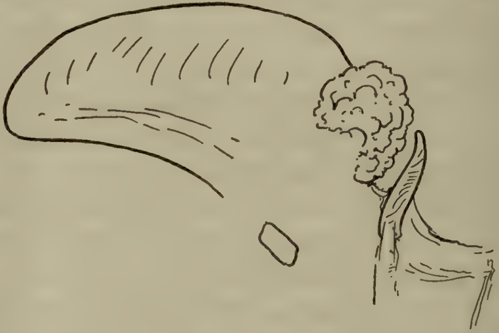

Fig. 686.

thyroid anlage origin probable, though I should not dare to exclude this possibility entirely. The tumor was somewhat

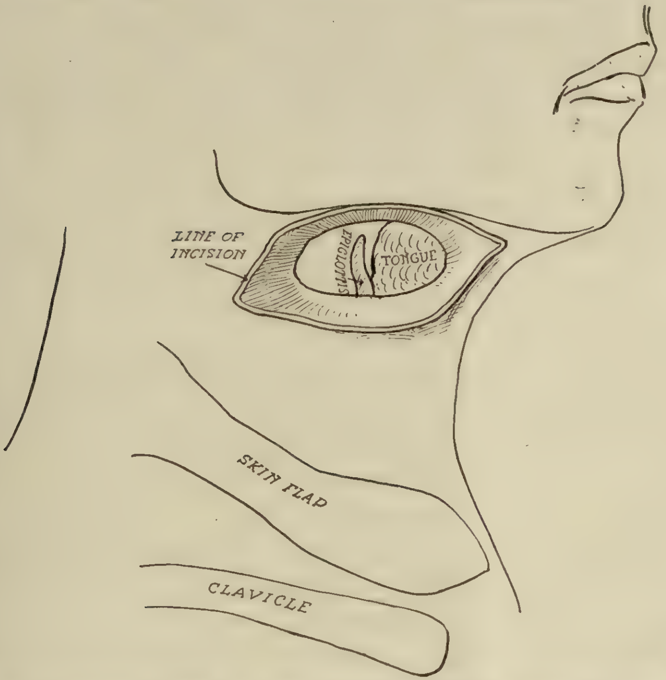

Fig. 687.—Opening under jaw, closed by inversion of a skin cuff, over which a pedicled flap was fastened nine months after the primary operation.

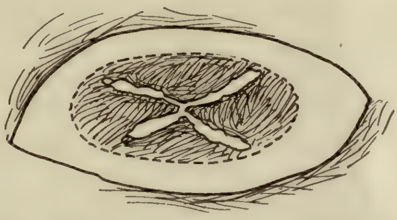

Fig. 688.—Shows inversion of the skin cuff, which consisted of cicatricial thin atrophic material, but gave some hold and protection to the pedicled flap.

flattened anteroposteriorly and had a necrotic looking surface. It sprung from that part of the tongue which is directly at the glosso-epiglottic navicula. Part of the edematous anterior covering of the epiglottis was removed with the mass. The adjoining muscular tissue was widely excised with the tumor, though there was no visible or palpable infiltration to any marked degree. The tumor bed after its removal showed normal looking glossal musculature everywhere. The lingual artery had been tied; the steps of the operation were performed slowly, always being careful to be in control of the bleeding. The tumor bed was sutured with chromic gut and the digastric tendon reunited. The lower part of the anterior pillar of the tonsil was united with the tongue laterally and in front of the epiglottis. Silkworm united the skin after the wound had been swabbed with 2 per cent. nitrate of silver. A gauze drain, soaked in tincture of benzoin, was inserted.

The primary tumor gave the same microscopic picture as the glands had shown. This primary tumor was somewhat pedunculated and the base was surprisingly free. There was no outspoken infiltration of the muscles at the base of the tumor to be found when the specimen was examined. The fact, however, that the tumor sprang from the navicula, where the lymphatic rete is very rich, explains why the glands were so much affected from a still rather slightly advanced primary growth.

Before the wound had been closed 50 milligrams of radium were inserted into the musculature of the tongue in front and above the hyoid bone. Close watch was kept for possible symptoms of edema of the glottis. The radium was removed after twenty-seven hours. The foot of the bed remained elevated for a week and the patient had to lie with his head constantly low and turned face downward. The feeding was a difficult problem. He received principally Bulgarian sour milk, which he had to drink with the head low and under close watch. A slight Trendelenburg position was constantly maintained, as pneumonia by aspiration was now the greatest danger. Only after the patient had become more able to clear his throat was the position changed for part of the time. There was, of course, much leaking of secretion, saliva, and food through the wound. The radium surely did its share in hindering wound healing, but this had to be accepted in the bargain. The middle portion, corresponding to the lodge of the submaxillary gland, remained open, and an annoying fistulous opening persisted with atrophic cicatricial walls. Radium in large doses was again applied, as it did not seem proper to yield in any way in the big issue, for the sake of saving the tissues around the fistulous opening. Thus its edges gradually retracted more and became thinner, more cicatrized, and harder as time progressed. The patient left the hospital on July 6th. In September a slough was removed from the area of the genio muscles where the radium had been inserted at the time of operation. We made the note that "this slough looks more like a radium necrosis of normal tissue than neoplastic tissue, though the general rigidity of the walls of the containing cavity was considered suspicious. The incisor teeth can be separated 2 cm." The tongue could be moved pretty well and could be protruded 3 cm. beyond the incisors. As the right hypoglossus and lingual nerves were resected when the tumor was removed, the right side of the tongue was paralyzed and its sensibility greatly reduced. By November he had gained 15 pounds. Up to that time he had been obliged to eat while lying on the left side. The epiglottis was fixed by the scar formations. The large hole on the right side gave a disagreeably free exit for the liquid and semiliquid food, which was the only kind he was able to swallow. However, since the beginning of November he was able to eat while sitting up. Entering of the food into the larynx was not any longer as common as previously. Since October 11th the unusually courageous and energetic patient had gone back to his office to work. By January the fistulous opening had reached the size of a half-dollar. The patient could close it somewhat while eating by forcible tilting of the head to the right side. In one way we were benefited by the opening, inasmuch as it allowed us to inspect the very area of the tumor bed. For this reason we were not in a great hurry to close it. The epiglottis and the adjoining portion of the tongue lay freely exposed in the gap. The epiglottis was drawn to the right, almost directly to the wound. The presenting area of the tongue had a scarred, firm aspect. There was no sign anywhere of a recurrence.

After a futile attempt in January, 1921 to close or, at least, to reduce the opening, a flap was formed of the skin over the sternomastoid reaching into the jugulum where the nearest healthy skin was available (March 28th). It was transplanted in several steps. It took, but the union with the upper anterior border of the defect failed, leaving a small opening. This had to be closed at a later session by a visor-shaped plastic, in which the healthy, transplanted skin was undermined, but was left attached on both sides, laterally and in front. Three cm. below the horizontal slit-like fistulous opening a parallel incision was now made, the undermined visor shaped doubly pedunculated area was then sutured to the well-freshened border of the fistula. Thus we finally had a firm closure of the very large gap in an entirely cicatricial and atrophic tissue. At present (April, 1923) the floor of the mouth on the right side is only of the thickness of the skin. The head is now held straight, the neck has limbered up considerably, and it is remarkable how the tongue is free and even the epiglottis has again a more median position. Speech and swallowing have greatly improved even during the last year, proving how these parts can rearrange themselves and how scars limber up by constant eager use The operation was in June, 1920; up to this time there are no signs of recurrence. The general condition and appearance are good.

CARCINOMA OF TONGUE AND TONSILLAR LODGE; RESECTION

On March 21, 1921 Mr. A. G. B., farmer, sixty-two years old, came to the office with the following history: Six years previously he began to notice a soreness of the tongue. From his description it seems to have been a harmless little marginal ulcer which healed on cauterizing with nitrate of silver. Then after feeling well for three years he received a kick from a cow on the left side of his jaw. Pain started under the left border of the tongue. At the same time he had pain in his ear. The condition never improved. In July, 1920 the area was burnt twice with electricity, and in September—we are told—raw carbolic acid was applied three times at weekly intervals. There exists now severe pain in the left ear. On the left side of the upper jaw we first notice a round mass the size of a cherry, which the *x*-ray shows to be an encysted molar. The left part of the

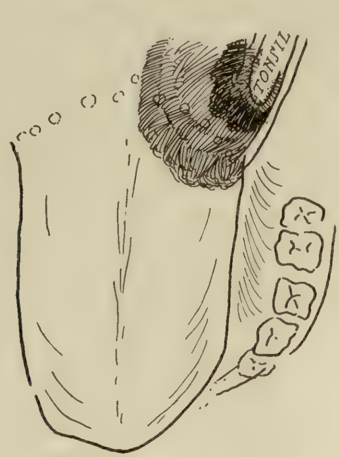

Fig. 689.

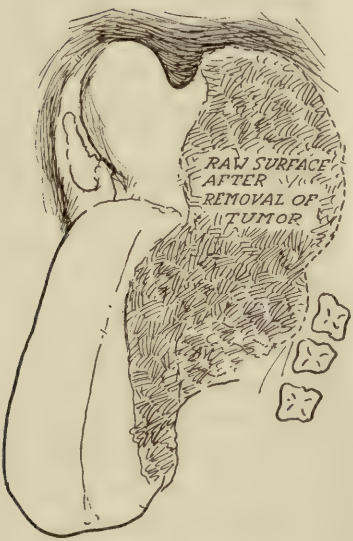

Fig. 690.

tongue near the palatoglossal fold is thick, hard, and partly eroded. The mass has the size of a walnut. This hardness goes over to the tonsillar lodge, the lower half of which is invaded by the growth.

On March 23, 1921 a block dissection of the neck glands was made. Both submaxillary salivary glands were removed with the rest. The microscope could not detect any involvement of the lymph-glands.

On April 5th the main tumor was removed. In ether narcosis the lower lip was divided in the median line and the incision continued down over the chin to the hyoid bone. Two holes were drilled into the lower jaw, one near the midline, the other about 1 inch to the left. The outer left incisor was extracted and the jaw divided with the Gigli saw. In another almost identical case difficulty had been experienced later on in keeping the two halves of the mandible in good and firm apposition. During the sawing with the wire we therefore changed the direction several times in order to avoid slipping of the fragments later on. After spreading of the jaw widely apart we tried to insert an intubation cannula on the top of which a short piece of a metal tube had been soldered for fastening a rubber tube, about a foot long. In larger operations far back in the mouth this had given us great comfort. A sea sponge was usually placed into the pharynx and bleeding could not interfere with the respiration. However, in the present case we were not able to introduce the tube apparently on account of the rigidity of the isthmus faucium, where our tumor was situated. Still I thought we would get along without a tracheotomy, but constant watch had to be kept on any bleeding. The tongue was separated from the left half of the jaw by dividing the mucosa along the floor of the mouth. Especially after cutting the region of the frenulum, the tongue can be pulled far out and over to the opposite side. As both (right and left) genio muscles remained attached to the right half of the jaw, we were safe against a later falling back of the tongue, and the parts were well exposed. Keeping about an inch from the neoplasm the tongue was resected step by step. The tongue and the tonsillar lodge, running upward along the outer side of the palatoglossus muscle, were removed in one piece. The palate and adjoining pharynx thus resected, the wound was quite wide (Fig. 690), but most of it could readily be brought together by suturing. The ascending palatine artery was the only vessel that bled after a clamp slipped. There was no marked dyspnea at any time. The condition at the end of the operation was fair.

The laboratory report was: Carcinoma simplex of very cellular type. The tumor had been of rather slow growth and was only slightly ulcerated. It formed a rounded tumor. These cases are known to give a better prognosis than those with early extensive ulcerations.

Two and a half days after this operation (April 7th) our patient was unlucky enough to develop a strangulated femoral hernia, due to much coughing, though he had been kept constantly face down in slight Trendelenburg position. The hernia was operated upon in local anesthesia. The remainder of the postoperative course did not present anything of particular interest. On April 18th 50 milligrams of radium were placed into the tumor bed. It was left in for forty-eight hours, which gave him 2400 milligram-hours at the very spot where we needed it. Some fear was, of course, felt as to a possible late arrosion of a larger vessel by a radium slough, when the patient would be out of reach, but the patient had to be discharged on April 21st. He was in reasonably good condition, but had considerable pain—undoubtedly from the radium. In September we injected 95 per cent. alcohol into the third branch of the left trifacial nerve at the foramen ovale. In April, 1922, a year after the operation, he stated that he never felt better in his life than right then. He had gained 15 pounds since the operation. His main trouble had been the difficulty in opening the mouth, but this was gradually improving. He could then separate the jaws 1½ cm. About four months after the operation a small sequestrum came away from the line of dividision of the jaw. On March 2, 1923 he came to the office upon our request, He had gained 35 pounds since the operation, weighing then 170 pounds. His speech is not very distinct. The teeth of the lower jaw can be separated from the toothless upper jaw for a distance of 2 cm.

The teeth on the left side fit perfectly with those of the upper jaw; however, on the right side the lower teeth close entirely to the inner side of the upper ones. The food is taken in soft form, but the patient is satisfied. The stump of the tongue cannot be protruded beyond the teeth, but is moving painlessly within its narrow limits. About half of the tongue seems gone. No signs of any recurrence so far.

It is, of course, too early to speak of a cure, but we are now glad we applied such a fierce dose of radium right in the start when there was most danger of dissemination. Protracted gentle radium treatment has never impressed us as being as effective except perhaps in skin cancers and in non-malignant conditions.

ACCIDENTAL COMPLETE EXCISION OF THE HEPATIC DUCT

The frequency of gall-bladder surgery and the trend to more active radical removal of the gall-bladder in severe forms of cholecystitis brought forth reports of most unpleasant injuries of the bile-ducts. In the case to be reported the whole of the hepatic duct, up to its division into the two (right and left) branches, was accidentally removed in excision of the gall-bladder. The case is as follows:

Mrs. T. M., sixth-nine years old, was admitted to St. Joseph's Hospital on October 10, 1921. She had been suffering from sharp pain in the gall-bladder area for four days. The pain never let up during this time. Her previous history gave no further information; she had always been well except during the menopause. Her general condition was good for her age. The liver dullness reached to the navel line, and the area corresponding to the gall-bladder was exquisitely tender to touch.

On October 13th a cholecystectomy was performed under local anesthesia with a little ether (3 ounces) during the deep work. The gall-bladder was firmly adherent to the colon and part of the duodenum. It was tense and hard. The base of the gall-bladder and the cystic duct were greatly thickened and inflamed, and bled readily and continuously. The cystic duct was, we thought, made out; it was tied with formalized catgut and cut. On removing the gall-bladder from within outward a cord about the size of a large cystic artery was tied. The

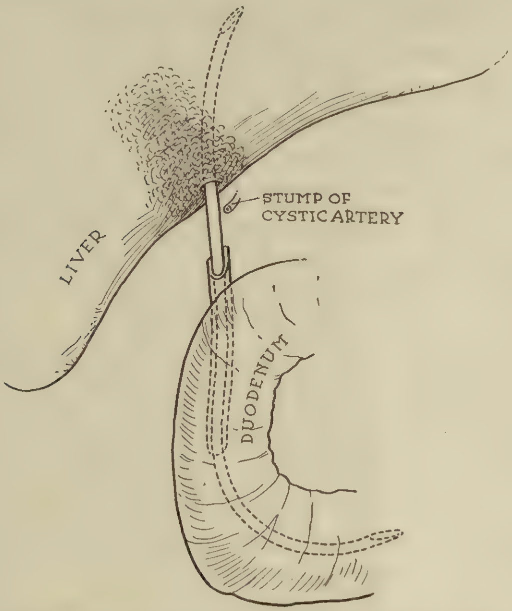

Fig. 691.—A catheter is inserted into the left hepatic duct and through the common duct into the duodenum. It is fastened to the cystic artery, the only reliable fixed point to be found.

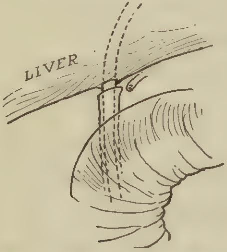

Fig. 692.—The common duct is approximated to liver. The stump of the hepatic duct not being found, the common duct is simply brought up to the point of emergence of the catheter.

gall-bladder was removed without being opened. Some smaller vessels were tied, the liver bed was not sutured, but a rubber tube and a collapsible rubber drain were placed in the sulcus and the wound closed. We were uneasy and feared some trouble with the ducts. While the assistants finished closing the wound we started examining the removed gall-bladder. It was greatly thickened and contained a stone of the size of a plum. The interior of the sac was necrotic, stained green. The cystic duct, greatly thickened, ended free, which caused a sigh of relief. But alas! on closer examination a channel 1¼ inches long was found underneath and parallel with the cystic duct and intimately glued to it. This channel became rather wider toward the upper end, where one could see that it was cut off just at the beginning of a bifurcation. A frozen section showed epithelial lining.

We hoped that we had only removed an abnormal right hepatic duct which perhaps joined the left hepatic abnormally low down. In the dictation given at the time I said: "The patient with her sixty-nine years would not stand an immediate reopening of the wound, and we feel that we should first watch what happens before going in again. In this way the very acute infection may subside a little, and we can find out if we really have removed part of the common hepatic or only the right hepatic duct." We decided then and there that, if conditions permitted, we would wait six days for the eventual reopening of the wound. By that time the patient is generally pretty well over the ether and operative shock, and still the wound can be opened readily without much force or bleeding. In our case we hoped to still find the ligatures of catgut as landmarks.

Four days after the operation, October 17th, the wound started to discharge bile profusely. Pulse and temperature were good, the former ranged between 68 and 80.

On October 19th, six days after the cholecystectomy, we reopened the wound with no difficulties. The wound showed very good healing. Four ounces of ether were used during this operation, which lasted one hour and ten minutes. Too much emphasis cannot be put upon a proper use of the anesthetic. Most of the operation was done with hardly any ether. Our anesthetist, Miss Gronvold, knows how to get along with the smallest possible dose with the help of cheerful encouragement. The wound had to be enlarged 1 inch upward and the same downward. The right lobe of the liver was lifted out and fresh adhesions divided. Gradually we gained a view of the parts after sufficient time had been given the oozing to stop. A stump was found with a ligature around it; from its location this might have been the tied off hepatic-duct. However, on untying the ligature and trying for an opening, blood came in spurts. It was the cystic artery, and was tied again. This stump was located far up, directly at the posterior end of the raw liver surface. In an area of granular and apparently somewhat torn liver tissue which corresponded to about the innermost portion of the gall-bladder bed, we noticed oozing of bile, and succeeded in running a sound—a thick uterine probe—into what we considered the left hepatic duct. We knew from the specimen that the hepatic duct had been divided at the point of division into the right and left hepatic branches. A small catheter (No. 14), cut on a slant, so as to have a soft-pointed end, was then inserted into this left hepatic duct for 2 inches and sewed with forty-day chromic catgut to the stump of the cystic artery, as there were no other firm tissues to get a good hold on. The wall of the duct could not be found by the searching needle. It had surely been divided at a point within the liver, as it was pulled forward with the gall-bladder. The stump of the artery with its firm tissue and itself barely alive on account of the ligation was a most welcome fixed point which would not readily dissolve the catgut. We then found the cut end of the common duct embedded in plastic fibrinous material behind the upper border of the duodenum. The catgut ligature greatly helped us in finding it. The ligature was untied; some colorless fluid escaped. The probe would only enter downward. We dilated the papilla of Vater and pushed the catheter, which measured about 4 inches from its fixation to the cystic artery, through the choledochus into the duodenum. The cut end of the duct was brought up to the point where the catheter emerged from the liver, and fastened again with forty-day catgut. There had not been time for any scar formation and the tissues could be approximated without any traction. This was surely due to early intervention. The catgut which brought the common duct up grasped only the liver tissue in the immediate neighborhood of the emerging catheter, but this seemed sufficient, as the parts were lying in free and easy apposition. Soft-rubber drains were inserted into the neighborhood of the anastomosis, leaving an interval of an inch. One rubber tube was introduced. Closure of abdominal walls.

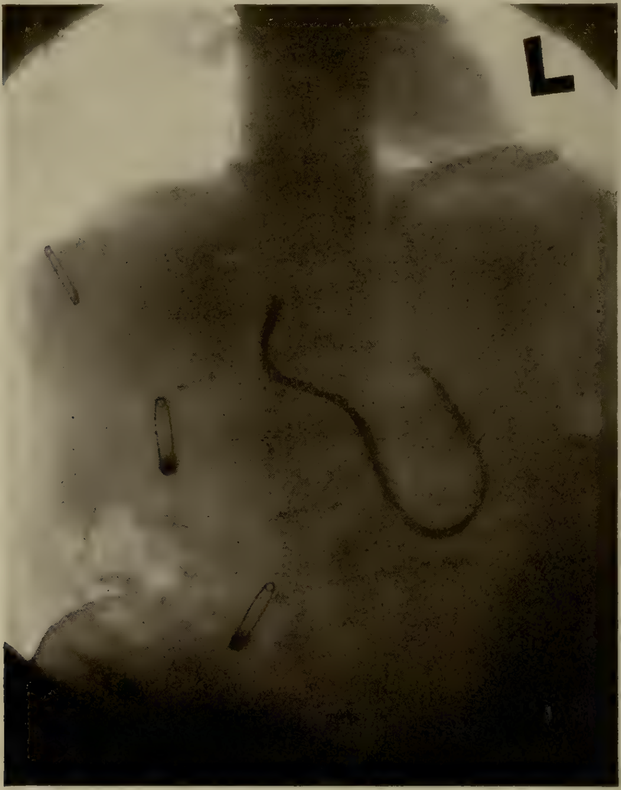

Fig. 693.—Catheter leading from left hepatic duct through common duct into duodenum, still in place (exactly as originally) after one year and five months.

For two days after the operation the pulse was very high, but it came down with digitalis. The temperature remained normal with exception of a short spell (with a chill) which lasted only a few hours. On November 14th (twenty-six days after the second operation) the patient was discharged from the hospital in good condition; for two days the feces had been colored and the discharge of bile from the wound had decreased. It stopped entirely promptly after that, and our patient improved steadily.

x-Ray pictures, which were taken at different times, show the tube to be still in place. It is in exactly the same position now (April 10, 1923), and has the same curve as at the time of the first *x*-ray examination soon after the operation (Fig. 693).

Note.—The lucky outcome appeared to be due to early recognition of the damage done before cicatricial changes had time to take place. The common duct was readily brought up to the liver and the parts reposed in good apposition without any tension. Perhaps the anchoring of the rubber tube to the cystic artery gave an extra firm fixation. At no time has the patient complained of pain; there is no jaundice, and with her seventy-one years she does the cooking and baking for the family. All last summer she took care of a large garden, daily carrying pails of water. Why does the tube not come away? Perhaps the fixation with forty-day chromic gut to the artery stump kept it long enough in place to cause some incrustations? The *x*-ray does not give any such shadow, though the tube is very sharply outlined. The intraduodenal portion has exactly the same density as the intrahepatic. What is going to happen? As long as the patient is feeling well and has no jaundice, we may well be satisfied. The longer the tube is in place, the more we are sure of good epithelialization and the less do we have to fear a final stricture.

A COMPLICATED CASE OF NEPHROLITHIASIS

Mr. J. W., forty-five years old, came to see us nine years ago for severe pain in his left kidney region, stranguria, and turbid urine. On November 4, 1913, a cystoscopy was made and the left ureteral opening was found inflamed. Catheterization of this ureter yielded pus. Microscopically pus-cells and cocci were seen; no tubercle bacilli. The general appearance of the patient was good. He was strong and fleshy.

On the following day the left kidney was laid bare. There was marked perinephritis. An abscess was found in the upper pole which was opened. The inserted finger felt a number of stones. Since there was no normal kidney tissue present, the organ was removed. It had been reduced to a functionless sac containing many stones, the largest of them measuring 2½ inches in length and ½ inch in diameter. November 8th the bladder was irrigated. Urine clear; no odor. The course was then smooth until November 22d, when the temperature rose suddenly to 105° F.; severe pain in the right side occurred and no urine was passed for eighteen hours. Hot packs seemed to relieve the condition. In the following twenty-four hours 76 ounces were secreted and the patient felt better. On November 24th he grew worse again; the temperature rising again to 103° F. The secretion of urine stopped and there was no urine passed from 9 A. M. until 11 A. M. the following day. *x*-Ray plates gave no information. The abdomen was large and firm. We then catheterized the right ureter and found an obstruction 3 inches from the ureteral opening and decided to operate without delay. An extraperitoneal incision was made in the right side, with its midpoint inside the anterior superior iliac spine. Two small stones were removed from the ureter. There was a gush of urine from above with some flakes of pus. The ureter was now free up and down. A small constriction at the point where the stones were seated was dilated and nicked. No suture of the ureter; soft-rubber drains to points 1½ inches below and above the ureter wound. On December 7th we made the note: "Wound practically closed." On December 16th the patient was discharged. The ureteral meatus looked normal and the urine was acid, though not entirely clear.

On January 16th our patient was readmitted to the hospital. He had had no trouble to speak of since leaving the hospital, though small particles of carbonates and phosphates had come away. The urine had been kept acid by large doses of benzoic acid and urotropin. On January 15th at 11 P. M. he had rather severe pain in the right kidney region. He had urinated just before. Then at 5 A. M. he passed 2 ounces, none since. He returned at once to the hospital in the morning of January 16th. At noon on January 16th 3 ounces of concentrated urine were recovered by catheter. The ureter was permeable. The trouble seemed located in the kidney pelvis. Vomiting occurred repeatedly that day and in the following night. The temperature rose to 102° F. on the following morning. I found no record of *x*-ray examination at that time. Blocking of the only kidney, left unrelieved for any length of time, could not be allowed. We thus had to cut down upon the remaining right kidney (January 17th). It was, as one would expect, quite large. The finger detected in the pelvis a sharp, hard object. Through a small incision into the pelvis a stone 2 cm. long and 1 cm. wide was removed. A gush of purulent fluid followed. The pelvis was further explored with a probe and found free of stones. The ureter allowed a ureteral catheter to be passed freely down into the bladder. No suture of pelvis. Four soft-rubber drains were inserted toward, but not directly to, the pelvic opening. The patient was comfortable immediately afterward. At first the urine came through the wound, but on January 20th note was made that all the urine went into the bladder. The temperature had promptly come down to normal, and as the patient was feeling quite well and extremely anxious to go home, he was allowed to be up on Janurary 30th, and discharged from the hospital on February 2d.

Three weeks later he consented to be demonstrated before the Ramsey County Medical Society. He was proud to show the three long scars which on his fleshy abdomen had almost girdled him, and he declared he felt well. But at 9 P. M. on the following evening (February 25th) he began to feel uneasy. A slight pain in the right kidney region gradually increased to great severity at 2 or 3 A. M. He vomited ten or twelve times before morning. There was no urine passed since 3 P. M. The patient, who had a good deal of experience by that time, declared "the pain is in the right kidney." The temperature was 100.8° F., pulse 96 when he was again brought to the hospital at 8 A. M. on February 26th. In the afternoon the temperature went to 101.6° F. Directly after his arrival at the hospital he was cystoscoped. Some little pus flakes were seen in the bladder and in the right ureteral opening. The ureteral catheter could only be inserted 2 inches. There was complete retention. After the catheterization the patient was asked about the pain in the right iliac region. He now stated that he had pain in this region different from the pain earlier in the attack, when it had been located in the right kidney. The patient could be kept comfortable with morphin and the general condition was good. Therefore we waited a little while longer for further developments, the most likely condition being a stone which had traveled down the ureter in this short time. We reasoned that if it had traveled so rapidly it might promptly progress further. Notwithstanding the wonderful fortitude of our patient, we were, of course, reluctant to reoperate if there was any chance to avoid it. On the same evening (February 26th) the right lumbar region presented a marked bulging and the integuments appeared infiltrated, so that it became necessary to incise, and this was done early next morning. An incision was made at the site of the pyelotomy scar. The fat layer was distinctly succulent and the tissues were edematous. Below the superficial layer friable hemorrhagic tissue was noticed, and on exploration with the finger much bloody fluid of urinous odor appeared. Neither the touch nor the eye could detect in what layer we were, but the smooth surface and funnel-shaped walls in the depth made us think that we were within a hydronephrotic kidney. Some side pockets partly (as we thought) in and partly outside the kidney were stretched open. Catheterization of the ureter was attempted, but was not successful. Two medium-sized urethral catheters were left for drainage in the depth of the funnel-shaped cavity. It must be added that just previous to the operation the patient had passed 6 ounces of saturated urine normally.

The patient had a good night following the operation. No morphin was needed. The next morning (February 28th) 10 ounces of bloody urine were passed per urethram, though the dressings were, of course, saturated with urine. The course from then on was surprisingly smooth. On March 20th a cystoscopy was done. The bladder showed hemorrhagic areas; the ureteral openings looked normal. On March 27th he was discharged with the wound nearly healed. The urine had cleared up considerably. Large doses of folia uvæ ursi tea were administered and the urine flowed freely. Thirty-six ounces were recorded as passed during the night before he left the hospital.

Since then our patient has been in what might be termed very good health. I saw him often for years afterward working as switchman for the street car company at a busy corner. He was given a rather light job, but had to be on his feet for many hours.

On March 12, 1923 I happened to see this patient by accident. He declared that he felt "first rate." He has no pain, except that he feels better if he wears a belt for support, as his weight is about 200 pounds. He works every day, does the hard work of a packer in a wholesale dry-goods house, and is the picture of health. The urine is 1028, of dark yellow color, contains a small trace of albumin (just noticeable). No sugar. No trace of turbidity.

To recapitulate:

1. Left-sided nephrectomy for stones, pus, and complete sclerosis.
2. Three weeks later: Right-sided ureterotomy for stones and suppression of urine.
3. Seven and a half weeks later: Right-sided pyelotomy for stone, with suppression of urine.
4. Six weeks later: Urinary phlegmon in right kidney region.

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THE SURGICAL CLINICS
OF
NORTH AMERICA

Volume 3 Number 6

CLINIC OF DR. ARTHUR E. HERTZLER

Halstead Hospital

TWO-STAGE OPERATIONS IN ACUTE STRANGULATION OF THE GUT

Case I.—Strangulated Femoral Hernia with Gut Necrosis.—A married woman aged fifty-six was brought into the hospital for the closure of a fecal fistula in the groin.

History.—A former pupil called me by telephone, stating that he had a patient who had strangulated femoral hernia of more than two days' duration, and, judging from local and general appearances, the gut was likely necrotic. What should he do? I advised that he cut down on the gut, drain *in situ*, forming a fecal fistula, thereby standing the best chance of saving the patient's life.

The circumstances of the development of this fistula was as above indicated. In the right inguinal region just below Poupart's ligament was a granulating area in the midst of which fecal contents were escaping. The skin about the granulating area was somewhat excoriated from the irritation of the intestinal contents. The skin above Poupart's ligament was normal. The patient's condition was excellent and only the discharging fistula separated her from a normal state.

Treatment.—The indications were to secure an anastomosis of the gut and to dispose of the fecal opening. The intra-abdominal work obviously must be accomplished without soiling the wound by the discharges of the fistulous area.

The fistulous area, shown diagrammatically in Fig. 694, *a*, was covered with wet packs of formalin solution, and this covered by a sheet of rubber protective sutured to the skin along the line of Poupart's ligament. The area above this ligament was then prepared in the usual way. A right rectus incision was then made and the two ends of the gut ending in the fistula were isolated. Each gut was then grasped between two forceps (Fig. 694, *b*) and cut. The ends of the gut ending in the fistulous opening were then cauterized and turned down for attention

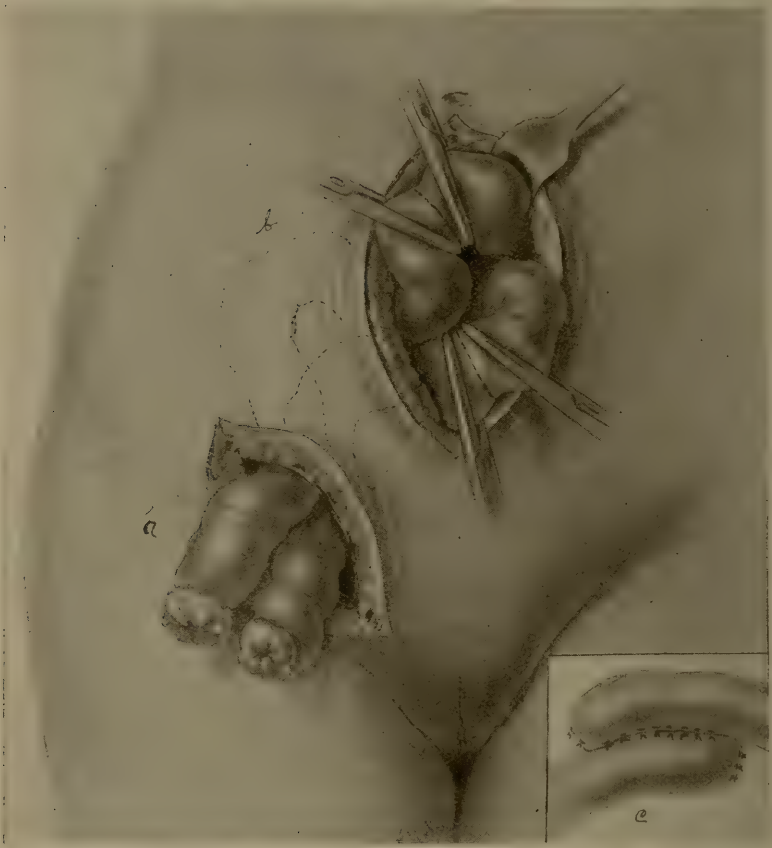

Fig. 694.—Showing the relation of the intestines before the operation: *a* Shows the ends of the guts protruding through the opening under Poupart's ligament made for the purpose of relieving the strangulation; *b* shows the loop of intestines separated and the point of severance decided on; *c* shows the side-to-side anastomosis completed.

later. The other ends were then closed and a side-to-side anastomosis made (Fig. 694, *c*) and the anastomosed area dropped back into the abdomen. The lower ends which had been packed

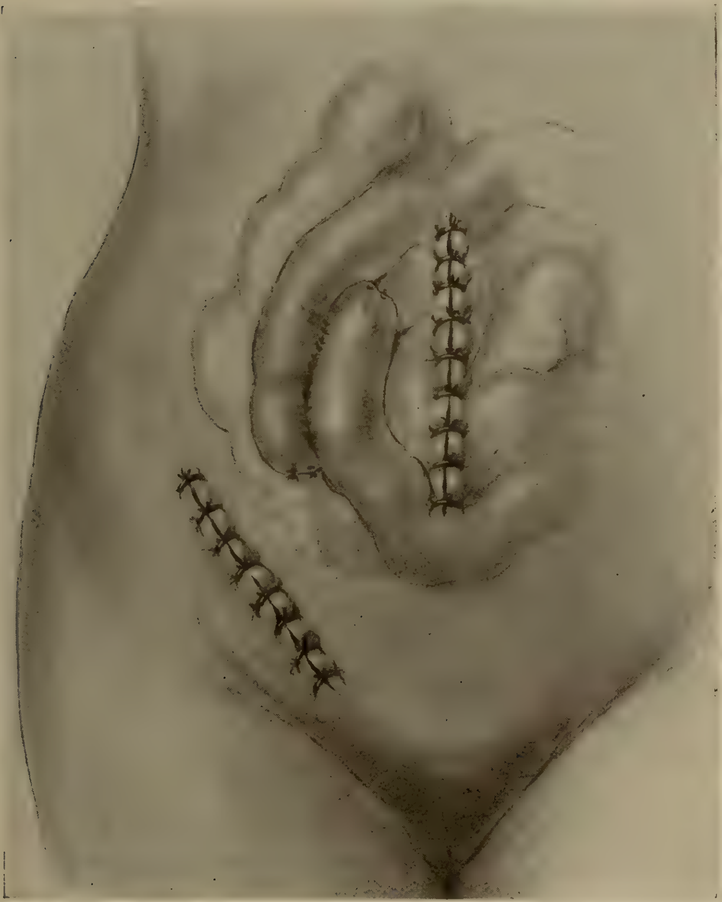

Fig. 695.—The abdominal wound has been closed and the side-to-side anastomosis is shown *in situ*. The lower wound is shown completely closed There should be a gauze and tube drain at the lower end.

off with lap towels were then attacked. (The rectus incision may be closed at this time [Fig. 695] or protected and left open until the fistulous ends have been removed. If it is closed at once the pack must be so placed that it can easily be removed from below.) The incision made at the time of strangulation by her attendant was circumscribed, and granular area, gut and all, freed. The two ends of gut together with the pack protecting them were then withdrawn. This wound was then closed except a drainage opening.

It is somewhat easier to prolong the lower end of the incision downward over Poupart's ligament, and pulling on the ends of the intestines, rolling them over and outward as one approaches the fistulous opening. This is the simplest method and best adapted to the inexperienced. The objection is that the wound will become infected about the fistulous opening, and this may extend some distance upward, leaving a weak scar with possible subsequent hernia. This is a minor matter and can be repaired later. Better this than expending too much time coaxing the guts through an opening below.

After-course.—The wound in the abdominal wall closed ideally except for two stitch abscesses. There was some suppuration in the line of the lower incision, but healing was complete in a month. Neither scar has weakened since the operation and the patient has remained well.

Comment.—By so operating one has a clean abdomen in which to make the anastomosis and one can protect the area with a fair degree of certainty from contamination. The second operation should be so timed that the intestinal loops in the abdomen are still in a state of partial reaction because they are then in a state better to defend themselves against such infection as may inadvertently enter the wound from the fistulous area. The proper time for the operation is after the patient has fully recovered from her obstruction and before all reaction in the gut coats has subsided. This time may be placed somewhere between the third and eighth week. It is true there will be more trouble with adhesions resulting from the obstruction than would be the case after the lapse of a few more months, but the added safety will more than compensate for the increased difficulty in technic. Besides, the patient is always anxious to be rid of the stinking mess at the earliest possible date.

By operating in two stages the mortality is greatly reduced because the patient disturbed by the strangulation is not in good condition to stand an operation of a duration of half an hour or more. What is equally as important, the gut at the time of strangulation may not show the extent of probable necrosis. After reaction has taken place one may with certainty select a point of unquestioned viability.

Case II.—Necrosis of the Gut from a Strangulation Over a Meckel Diverticulum.—A farmer aged forty-six was brought to the hospital for relief of a gut fistula.

History.—Following an acute generalized abdominal pain he had vomiting and distention. The diagnosis of acute strangulation was made. At operation a loop of gut was found imprisoned behind a band from a Meckel diverticulum. A segment of gut about 15 inches in length was intensely black and showed no evidence of viability after the usual tests. This loop was pulled to the left of the incision, including 4 inches of apparently healthy gut. The gut was carefully sutured to the peritoneum, and then the line of suture packed off with gauze and the remainder of the wound closed. The loop of necrotic gut reached to a point on the level of the anterior superior spine. This terminus of the loop was carefully walled off from the wound and drained. This relieved the intestinal obstruction. In about a week the necrotic gut had sloughed and the remaining stumps of healthy gut were trimmed off to the level of the wound now safely healed.

The patient now enters the hospital to be rid of the intestinal fistula. This is diagrammatically represented in Fig. 696. It consists of a double-barreled tube opening on to the surface of the abdomen.

The first act was to secure an opening from loop to loop. This was accomplished by the well-known stunt of cutting across the septum by gradual pressure of a spring forceps. These forceps are passed with one limb down either gut lumen. The spring presses the two gut surfaces together, securing adhesion by the pressure of these two surfaces (Fig. 696, *a*). After about ten days the tissue grasped by the forceps had caused necrosis and a state shown in Fig. 696, *b* will have been obtained. There is a restoration of the lumen of the gut with a fistulous opening leading to the surface of the abdomen. The problem, then,

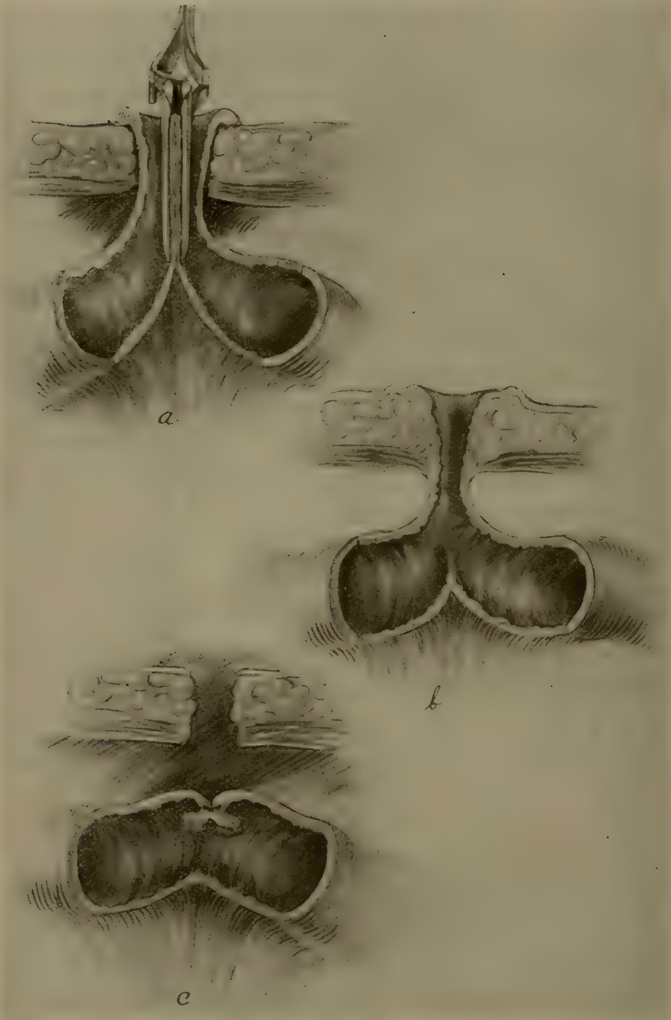

Fig. 696.—*a* Shows the forceps, one limb in either loop, pressing the surfaces together in order to cause them to unite and the septum to disappear; *b* shows the resulting fistula after the forceps have cut through; *c* shows the fistula dissected out, and the end turned in.

is to get rid of the small fistula remaining. The opening was surrounded by a subcutaneous suture, shutting it off. The abdomen was cleansed and the opening sealed with collodion. The fistulous tract was then circumscribed by an elliptic incision and followed down to the gut, cut off and inverted, and the gut dropped (Fig. 696, *c*).

A simpler way is to dissect out the fistulous tract down to the peritoneum, only tying it off and closing the wound above. This saves opening the peritoneal cavity, but leaves the gut fastened to the anterior abdominal wall.

It is well to allow some weeks or months to elapse after the forceps have cut through the septum before the closure of the opening in the abdominal wall is attempted. Once the fecal current can pass direct, the opening quickly narrows down materially.

The theoretic objection, that when the gut is left attached to the abdominal wall a new strangulation may form later, must be admitted. This, however, has not happened in my experience.

Comment.—By following the conservative line indicated in the case here reported improves enormously the prognosis. Immediate anastomosis in acute obstruction has a very high mortality in the hands of the experienced operators, and in the hands of the novice is nearly always fatal. There is the objection that a nasty fistula is produced and the convalescence is much prolonged. But a convalescence, even if prolonged, is better than a nice smooth fatality.

CHRONIC TRAUMATIC EMPYEMA CAVITY LINED BY SKIN-FLAP

History.—The patient, a farmer aged forty-six, came in with a complaint of a sinus in his left side.

One year ago the patient was accidentally hit in his side while moving a stove. There was no breaking of the skin, no swelling, and no considerable soreness. One month later he fell and struck the same side against a sharp object. There was slight swelling following, but no break in the skin. There was soreness for a short time with the swelling, but rubbing the site caused the swelling to disappear. In one month a permanent swelling appeared. He worked as usual and paid no attention to the swelling. This spot remained all winter, and at harvest it broke and began discharging pus, and has continued discharging since. Three weeks ago the patient caught cold in the sinus, followed by shortness of breath and temperature to 103° F. Osteopathic treatment relieved the fever in two or three days, and there has been no fever since. There has been occasional cough and he has gotten shorter of breath the last week or two.

His general health has always been good and his appetite remained good until the past week. There was no loss of weight until the last three weeks, but during this time he has lost 17 pounds.

Examination (W. W. Holley).—Patient does not look acutely ill; nutrition is fair, the skin warm and elastic. The eyes react to light and accommodation; the teeth have some repair work; there is some retraction of the gums from pyorrhea. The chest is large, symmetric; respiratory movements free and equal above, somewhat lessened below on the right side. There is a sinus over medial part of sixth rib anteriorly on the left side which is discharging pus. Resonance on the right side and the upper part of the left is normal. Below fourth rib on the left there is flatness. Breath sounds over the resonant areas are normal, but distant and diminished on the left side below. The apex-beat is felt at about 9 cm. in fifth intercostal space.

x-Ray examination of the chest shows a shadow extending almost to the top of the left chest. White blood-cells 10,400.

Diagnosis.—The diagnosis is clearly that of empyema.

The cause of the empyema is the chief object of interest. Apparently there was a traumatic periostitis of the rib. This seems to have remained dormant until six months ago, when it opened externally spontaneously. Until three weeks ago it seems not to have caused any disturbance in his general health. Three weeks ago something happened which he ascribes to a cold. Then fever, cough, and loss of weight began. We may conveniently assume that the major part of his illness, the empyema, dates from this time. We must assume that the external sinus was inadequate to drain the pus, and it formed an additional avenue into the pleural cavity. Whatever may have been the nature of the original infection discharging on the surface many months, it must by then have been a mixed infection. An abscess of this sort breaking into an unprotected pleura must certainly have killed him, but it was not sufficient to more than send him to an osteopath. Therefore there must have been some pleural involvement before, and something caused an exacerbation at that time, possibly a disturbance in the outflow. Chronic inflammations of the rib periosteum is usually tubercular in character, and the long continuance before rupture is in harmony with this, though the general physical make-up of the patient speaks against this. There was no evidence of syphilis.

Treatment.—Obviously, operation alone can be of avail. A drainage of the left chest with resection of a rib was done. Two sinuses communicating with the pleural cavity were traced. The pleura was found to be much thickened and there was an area of calcification in the parietal pleura as far as the finger could reach. The diaphragmatic pleura was much thickened, as was the pleura over the left lung, but there was no calcification. A large amount of thin yellow pus drained away.

Postoperative Course.—10/11/19: No postoperative shock. Wound drainage considerable; thin yellow pus.

10/12/18: Temperature 102.5° F. today. This is the highest since operation. Pulse 100. Much thin yellow pus discharged.

10/14/19: Wound dressed, gauze pack around the drainage-tube removed (W. W. H.). Temperature 100.4° F. From this time on the patient's course was rather unchanged. There was considerable thin purulent discharge every day. This changed at the end of a week from yellow to a pinkish yellow. It did not seem to increase in amount even up to the day of his dismissal from the hospital. He ran a mildly septic course. The temperature dropped to about 99° F. every morning and went to 100° to 101° F. in the evening. The patient suffered no pain. The drainage-tube was not removed or shortened. The pulse ran from 80 to 100.

Condition at Dismissal.—The original drainage-tube was left in place and not shortened. Considerable pinkish-yellow thin pus discharged from wound every day. Temperature 99° to 101° F. The patient feels well and has a very good appetite. He was allowed to go home, with instructions to return in a month for examination.

1/16/20: Patient returned for examination. He has been draining a great deal of pus ever since leaving the hospital In the last two months he has been irrigating the cavity with iodin on the advice of his physician. He has run a temperature of 99.5° to 102° F. ever since leaving. He now has white blood-cells 9200, temperature 99.6° F., pulse 112. Three weeks ago his feet started to swell. They would go down every night and get worse in the daytime. No shortness of breath. He has lost about 20 pounds in weight since the first operation.

Examination.—Patient looks well nourished, but acutely ill. Head and neck negative. Lung expansion poor on the left side. Left chest practically immobile. Decreased resonance to dulness on percussion over whole lower left half of the chest. Breath and voice sounds undemonstrable over the dull area. No cardiac murmurs, rate 110. Apex-beat not found.

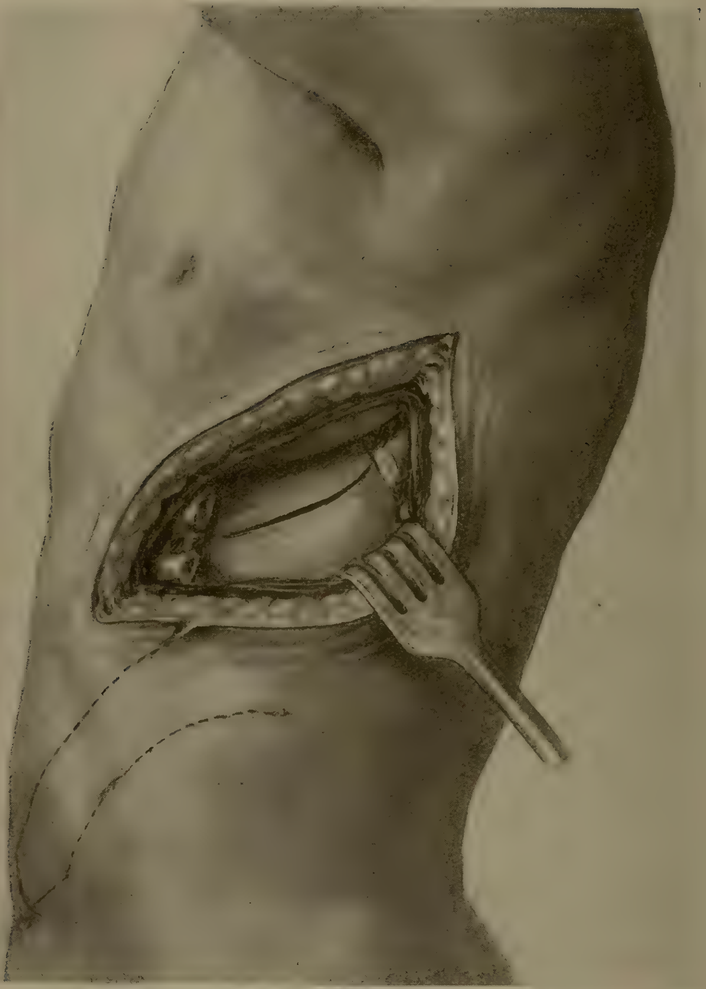

Fig. 697.—The ribs are shown resected with a simple slit in the frontal pleura. This pleura was removed as far as possible together with the calcareous plaques embedded in it. The dotted lines over the side of the abdomen show the size of the proposed flap. (The flap should be at least as wide again as the artist has shown it.)

Abdomen negative. Extremities negative except for slight edema of legs and feet.

Diagnosis.—Chronic empyema, left side. Defective drainage.

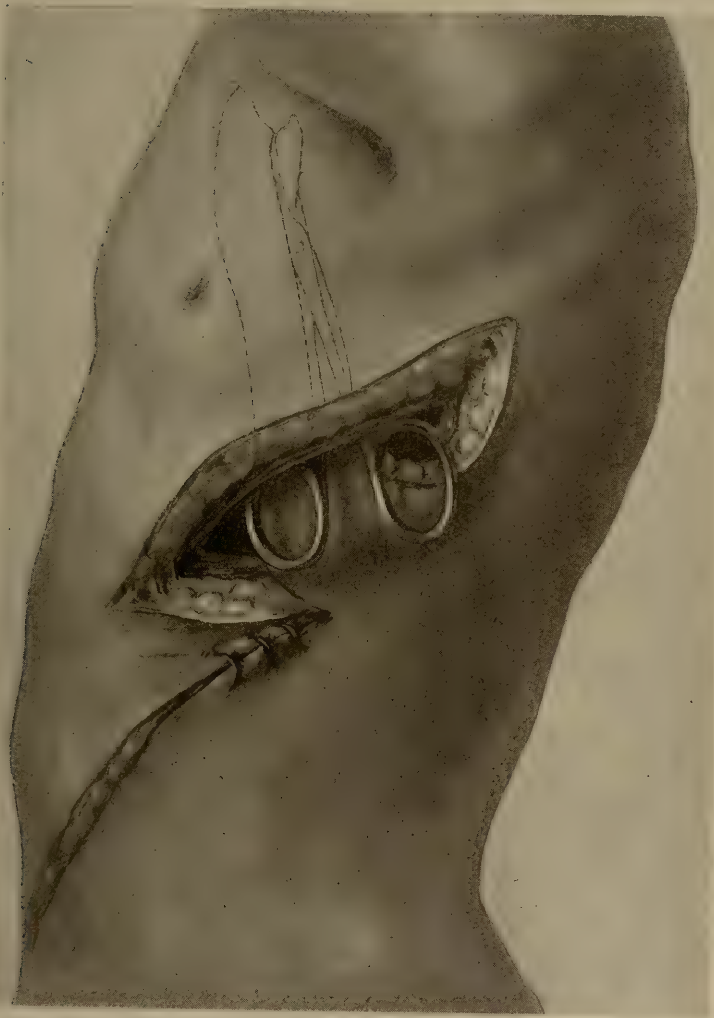

Fig. 698.—The forceps are shown grasping the apex of the flap. The drawing is faulty in that the flap is shown entirely too small and is printed too much forward. The flap must be directed to the apex of the cavity wherever that may be.

Treatment.—Some means of obliterating the cavity or at least establishing permanent drainage must be attained. Following the idea of Beck, it was decided to line the cavity with skin.

Operation (1/17/20): Under local anesthesia two ribs were resected and the empyema sac opened widely (Fig. 697). The calcareous deposit, already mentioned on the parietal pleura, was removed. A loop flap of skin was outlined on the abdominal wall below the opening (Fig. 697) and dissected up to the margin of the wound, and turned into the sac. Having had trouble in previous operations of this kind in keeping the flap pointing to the top of the cavity, I attached a 7-inch forceps to the apex of the flap and then pushed forceps, flap, and all into the opening (Fig. 698). By suturing the handle of the forceps to the skin and fascia the flap had to stay in place. A gauze tampon held the flap against the visceral pleura.

After-course.—1/17/20: No operative shock. Temperature 99.5° F., pulse 120 tonight.

1/18/20: Pulse 130, temperature 102.4° F. tonight. Wound draining much pus. Patient complains very little. Sweats profusely almost all the time. Feels well, but looks pale and sick.

1/19/20: Temperature down to 100° F. today. Draining much red-stained pus.

1/22/20: Complains a great deal today of the hemostat gouging him. Hemostat removed. Skin-flap stayed well up in place. Temperature subsiding.

1/24/20: Gauze pack removed from abscess cavity. Much pus drainage followed its removal. The turned-in flap seems firmly fixed. A smaller gauze drain was inserted.

1/30/20: Gauze drain removed and cavity left wide open. Feels well, temperature 99.3° F., pulse 98.

1/30/20: The granulating area around the wound covered with Thiersch grafts from the left thigh, placing them as far as possible into the cavity. Grafts covered with a cage and dressed open.

2/3/20: Wound dressed. Practically all the skin-grafts seem to be in place and in good condition.

Condition at Dismissal.—2/4/20: Wound seems to be healing well. Skin-grafts are taking. Some decrease in the amount of pus drainage. Temperature normal for a week; pulse runs from 90 to 100.

1/10/23: There is a cavity holding about a pint, skin lined in its entirety. The patient is entirely well.

Comment.—Judging from the calcareous deposit in the pleura, the empyema was of long duration. It seems almost incredible that it should have caused so little trouble The edges of the sinuses from the pleural cavity converging to the single external opening had thick walls and were, therefore, much more than three weeks in forming. We may conclude, therefore, that we had a chronic traumatic empyema which opened spontaneously through the external wall of the chest.

A misinterpretation of the history led to an unnecessary dilatory treatment. It was recognized, as already stated, that if an abscess had broken into an unprotected pleura he must certainly have died in a few days. We failed to follow this obviously correct observation to the operating-room, and treated him as an acute empyemic, by drainage. When the calcareous areas were found the error was obvious, but having no equipment for a flap operation, it was easy to conclude a preliminary drainage was the thing to do, and that his general condition would improve under drainage. But it did not improve. His condition was worse on his return, due to imperfect drainage, than when he left the hospital. Since there was no other reason for his disturbance than inadequate drainage, the more radical operation was done.

The use of the forceps to hold the flap in place proved a very convenient and efficient means of solving the most annoying step of the operation.

PERIRECTAL MELANOBLASTOMA DEVELOPING IN A CUTANEOUS HEMORRHOID

The patient, aged forty-seven, came in with complaint of pain in rectum.

History.—The trouble began two months ago. His bowels became very constipated, and on taking an enema the enema tip struck an extremely tender area. It gave him intense pain. From that time he has had some pain in the anal region every day. The attacks of pain increased in severity and in duration until the last month, since which time it has been present almost continuously. Movement of the bowels did not increase it at the time they moved, but just afterward the pain was intense. He has watched for a discharge of some kind, but there has never been any. The pain is just as severe at night as in the daytime. It interfered so with his sleep that he lost strength and weight.

Examination.—Patient is very poorly nourished, poorly muscled, apparently has lost considerable weight lately. Eyes react slowly to light, but good to distance. Pupils regular, tendency to be contracted. Mouth and throat negative. Heart inside left nipple ring about 1 cm. and at right sternal border. No murmurs. Lagging expiration over left upper chest. Does not expand as well on inflation. Percussion note somewhat impaired over left upper lobe, but definitely so at inferior angle of left scapula, where breath sounds are increased, numerous crepitant vesicular râles of a fine moist quality are heard. Few râles at angle of right scapula, but more of a bronchial type. Left axilla contains numerous hard glands size of bean and larger. Epitrochlear glands small, hard, definitely palpable.

A small hard, tender lump is found to right of anus in or just outside of anal sphincter (Fig. 699). It is about the size of a hazelnut, firm, elastic, and the skin covering it is reddened, showing a deep blue color beneath. The anal region otherwise is free from any trouble.

Diagnosis.—The circumscribed character and the location of the lesion proclaim it to be a cutaneous hemorrhoid containing a blood-clot. The long duration and the degree of disability complained of are out of the ordinary, but the patient is of the type affected profoundly by small lesions.

Treatment.—2/22/20: Under local anesthesia the mass was burned down upon with a small electric cautery. Instead of a clot a small abscess was opened up. The whole inside of the abscess was cauterized.

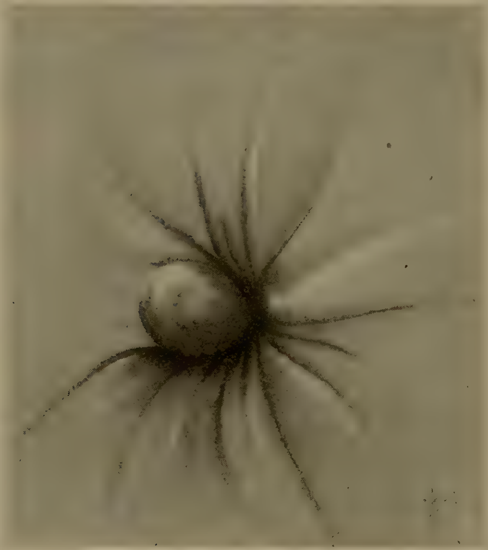

Fig. 699.—Cutaneous pile showing beginning malignant transformation. (Drawing from author's sketch.)

After-course.—2/23/2: The patient complaining of severe pain in anal region. Temperature 100.5° F. He is unable to void urine.

2/24/20: Wound infected. Much swelling and redness around wound area. Complains of much pain when bowels move.

2/25/20: Patient unable to void. About a quart of urine removed by catheterization. Still complains of much wound pain. Parts swollen and red. Temperature 101° F. Area very tender to pressure.

2/26/20: Wound area opened up, and discharged considerable pus. Pain relieved. Patient able to void urine. No rise of temperature.

Condition at Dismissal.—Burned area sloughing out. Small amount of foul-smelling pus discharging with slough. Patient feels much better. Normal temperature.

Comment.—The trouble lines up with an infected thrombus, with considerable perianal involvement, save that the duration was too long and the pain too severe.

Second Admission.—The patient returned in two months and it was noted that the wound had not healed properly. With sitz-baths healing took place, but a tender indurated area remained. A hard lump the size of the end of the little finger with a small yellow crust formed. In a week a small pimple formed at the site of old scar, ruptured, drained considerable yellow pus. He felt good for a day or so; then discharge stopped and pain started again. He now has continuous pain, for the past two nights very severe.

Diagnosis.—Pararectal abscess with possible fistula formation. Because of the man's general health and indefinite findings in the right apex, tuberculosis was thought of, but the pain was much more intense than is usual in tubercular affections of the anal region. The character of the discharge and the intensity of the pain suggested actinomycosis, but repeated examinations gave no evidence of such a possibility.

Treatment.—Operation. General anesthetic. An incision through mass with electric cautery knife revealed a circumscribed, firm, granular looking area 3 by 2 cm., from which a little seropurulent material drained. Cauterized through and around mass. Portion removed for section. Clinically looks like gumma. Sinus did not lead to gut, sphincter not cut, wound left open.

After-course.—6/15/20: Gauze drain removed from pararectal wound. Some liquid fecal drainage from rectum. Wound is quite dry and clean.

6/16/20: Wassermann negative.

6/29/20: Has been taking sitz-baths for twenty minutes daily. All induration has left except nodule size of butter bean at top part of wound.

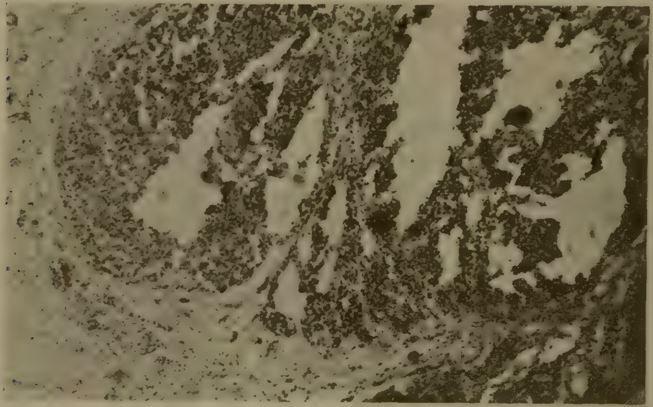

Fig. 700.—Slide from excised tissue in the perianal region. A few large ovoid cells is seen mingled with leukocytes and normal cells.

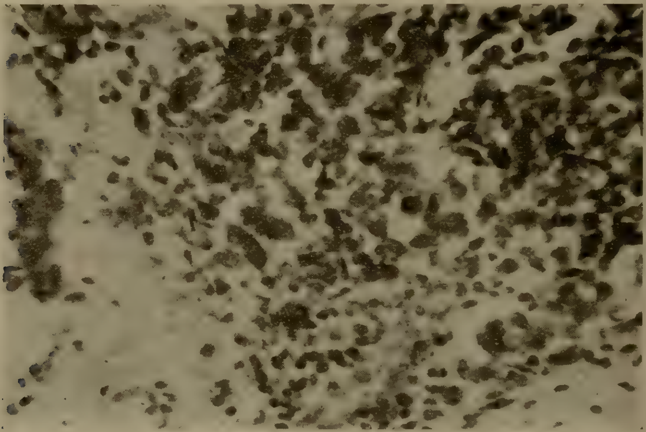

Fig. 701.—High power of the preceding.

7/4/20: Small hard mass described on 6/29/20 has enlarged to size of thumb, and has extended over an inch superiorly and posteriorly around rectum. Is firm and movable. Has been taking twenty-minute sitz-bath daily.

7/5/20: Discharged, to return in a week or ten days for observation. Mass described above is very tender, making a rectal examination practically impossible.

Histologic Examination.—Slides made from the tissue removed indicated neither syphilis nor tuberculosis. On the contrary, masses of rather large cells were found (Figs. 700, 701) which were arranged in groups throughout the slide, with masses of connective tissue between containing few nuclei. The cells looked neoplastic, but the arrangement of the groups and the general character of the tissue made it seem likely that it was granulomatous.

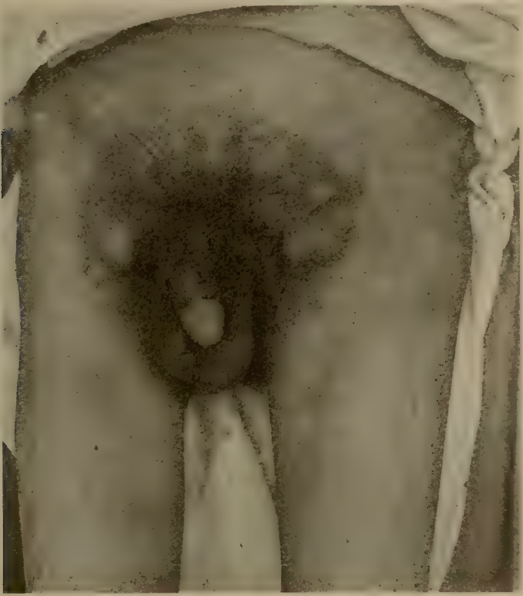

Fig. 702.—Large bilateral inguinal lymph-glands.

Third Admittance.—He returned in two weeks, presenting the following findings: Abdomen scaphoid, rather tense. No masses, no tenderness. Left inguinal glands somewhat tender, greatly enlarged, two glands, 4 by 2 cm., hard and firm, somewhat tender; numerous smaller hard individual glands on right (Fig. 702). Knee-jerks sluggish; negative Babinski. The rectum presents a mass about $3\frac{1}{2}$ cm. long by $1\frac{1}{2}$ cm. in diameter at lower left border of external sphincter (Fig. 703), firm, feels like cartilage. Just above this is a boggy bulging area about 1 cm. in diameter, red, very tender, and to the left of it what appears like the opening of a sinus.

9/14/20: Under local anesthesia the larger of the two glands in right inguinal region was removed. The section of this showed a grayish-yellow surface containing here and there yellowish areas. The slide shows definite malignancy (Figs. 704, 705), of probably melanoblastic origin, from the chromaffin cells of the mucocutaneous margin of anus.

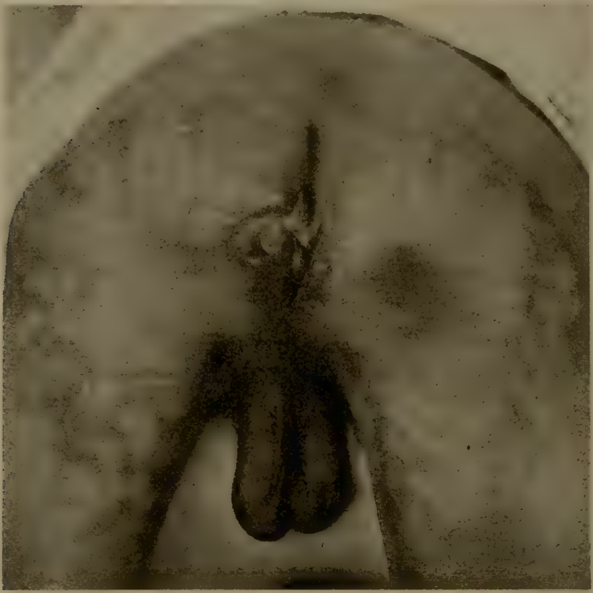

Fig. 703.—Large nodular mass situated to the left of the anus. This is a small opening discharging a yellowish pus.

The patient died four months later of progressive weakness.

Comment.—The terminus is easy to understand, but the relation of the malignant stage to the conditions when he was first examined is not so clear. Melanoblastomas are painless throughout their course. A blood coagulum in a pile is very painful. It is safe to assume that in the beginning it was a cutaneous hemorrhoid. Why the lesion did not heal when opened may be explained by the fact that there was an extension beyond the area drained. It was only after the excision of the mass because it was thought to be tubercular, that definite neoplastic

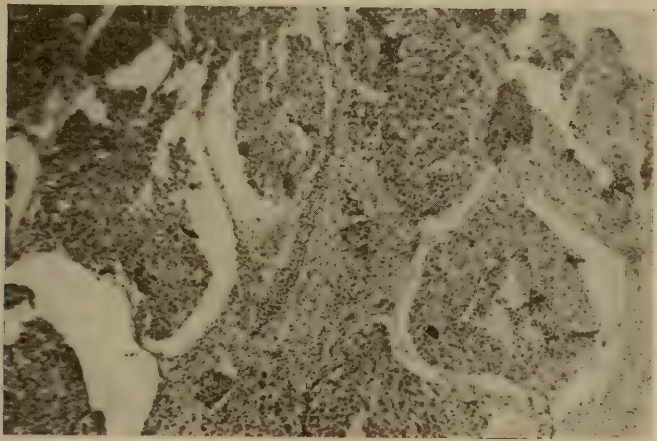

Fig. 704.—Slide from the inguinal lymph-gland. The typical nest formation characteristic of the melanofilastomas is shown.

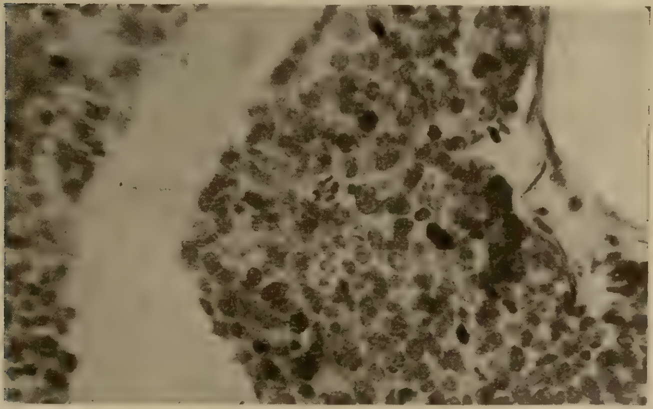

Fig. 705.—High power of the preceding. The large cells with ovoid cells and prominent nuclei can be seen.

characters developed. Just what, why, and when the transition occurred cannot be stated.

A very few, something like five or six, melanoblastomas, under the name of melanosarcomas or melanocarcinomas, have been reported in the literature. One of them, like this, seemed to have started in a cutaneous pile. In none of them was the course of the disease followed for so long a time.

This serves once again, as a warning, not to be too sure in prognosis. A little innocent pile may cause one chagrin and humiliation.

DESCENSUS AND DISPLACEMENT OF THE UTERUS IN A YOUNG WOMAN

A woman aged twenty-four comes complaining of backache and irritation of the bladder.

History.—She has always been healthy until the birth of her first and only child a year and a half ago. Since that time she has never been strong. The menses began the third month after childbirth and has been regular every twenty-eight days, without pain, and lasting four days. She had much backache from the beginning. Lately this has become much worse, and is aggravated by being on her feet, particularly during the few days preceding menstruation. Recently she has had irritation of the bladder after urinating, with a frequent desire to urinate.

Examination.—The patient is well nourished, but has a tired look. General examination is negative Urine 1010, acid, somewhat clouded, and contains many leukocytes There is a second degree laceration. The cervix is just without the introitus and points to the meatus. It is not lacerated and not eroded. There is some sagging of the anterior vaginal wall. The fundus is in deep retroflexion, movable, somewhat tender. The left ovary is palpable and tender.

Diagnosis.—The displacement of the uterus and the descensus explain her symptoms. The bladder symptoms obviously are due to the dragging on it by the displaced uterus.

Treatment.—The disease being a mechanical proposition, the operation must be corrective. The round ligaments were shortened by the Coffey method. This brought the fundus forward, but vaginal examination, after the completion of the ligament shortening, showed the cervix low. There was but little sagging of the anterior vaginal wall, and a simple repair of the perineum would do no more than form a shelf on which the cervix might rest. A shortening of the broad ligament was therefore done by the following method: An incision was made in front of the cervix and its anterior surface freed to just above the uterine arteries. The broad ligaments were then isolated by passing a blunt scissors under them (Fig. 706). Sutures were then passed through the ligaments close to the cervix, to prevent bleeding from the stump, and the ligament grasped with a forceps to prevent its retraction (Fig. 707). The ligament is then cut loose and freed for a distance of 1½ inches (Fig. 708). The opposite ligament is then freed in like manner. Sutures of No. 2 twenty-day chromic gut are then passed through the tip of one ligament and through the base of the other (Fig. 709). The ligatures are then tightened, pushing the cervix upward as the sutures are tied (Fig. 710). Closing the incision in the vaginal wall completes the operation. A repair of the perineal laceration completed the operation.

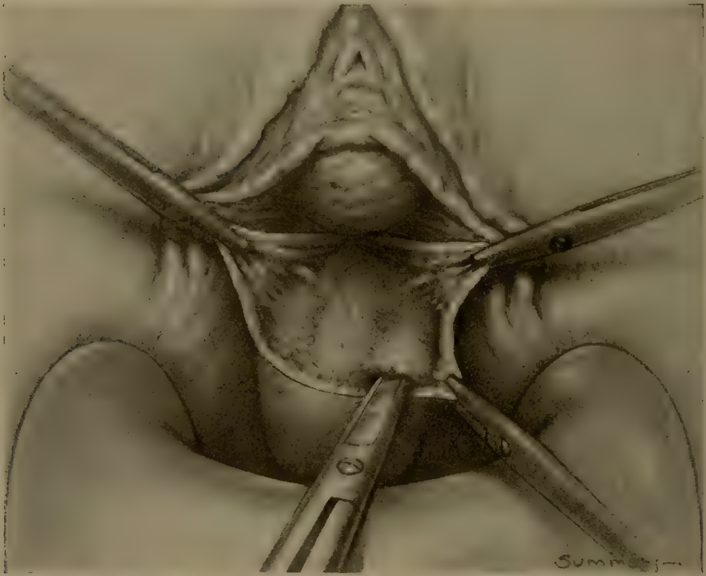

Fig. 706.—The anterior surface of cervix has been freed and scissors passed beneath the broad ligament.

After-course.—The patient recovered without disturbance and was freed from her complaints.

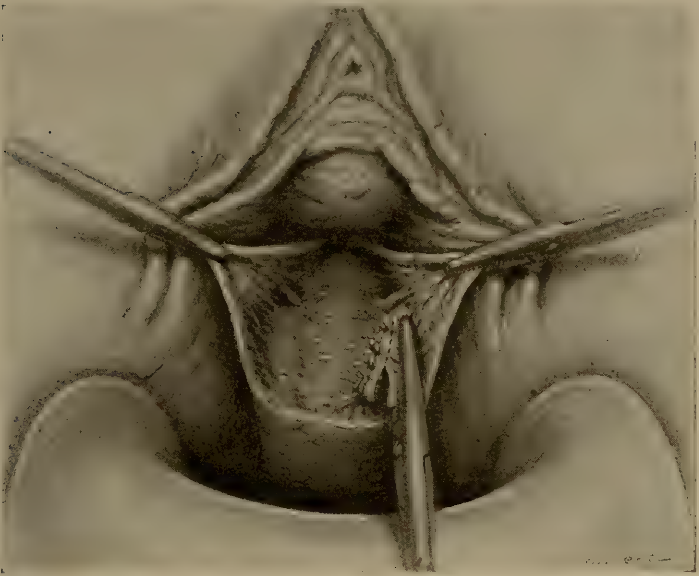

Fig. 707.—Hemostatic ligatures have been placed at the insertion of the ligament. The forceps prevent retraction after it has been severed.

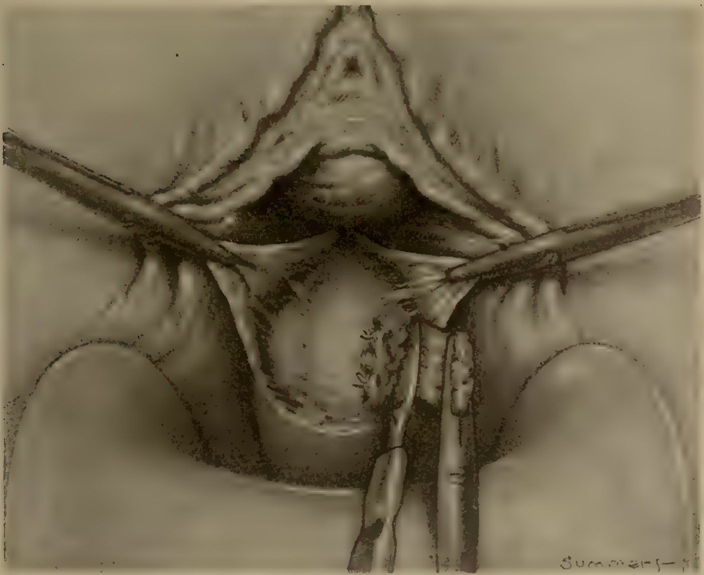

Fig. 708.—The ligament has been cut and is being freed from the surrounding tissues.

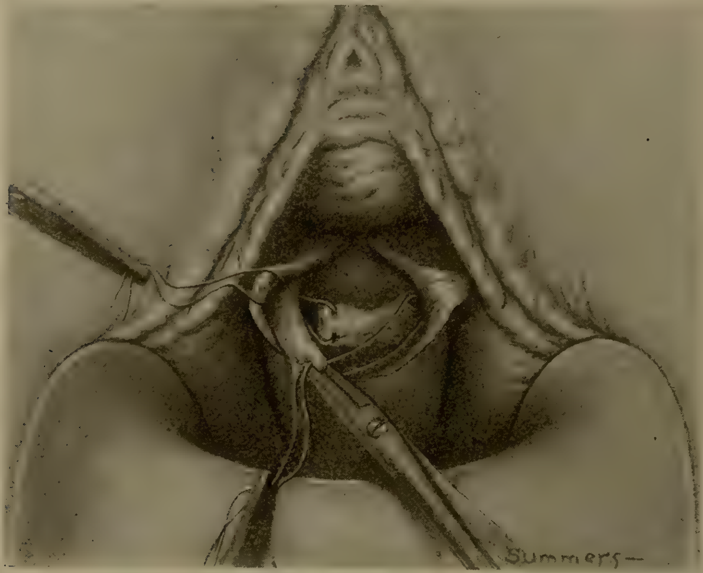

Fig. 709.—The ligatures are passed through the tip of one ligament and through the base of its fellow.

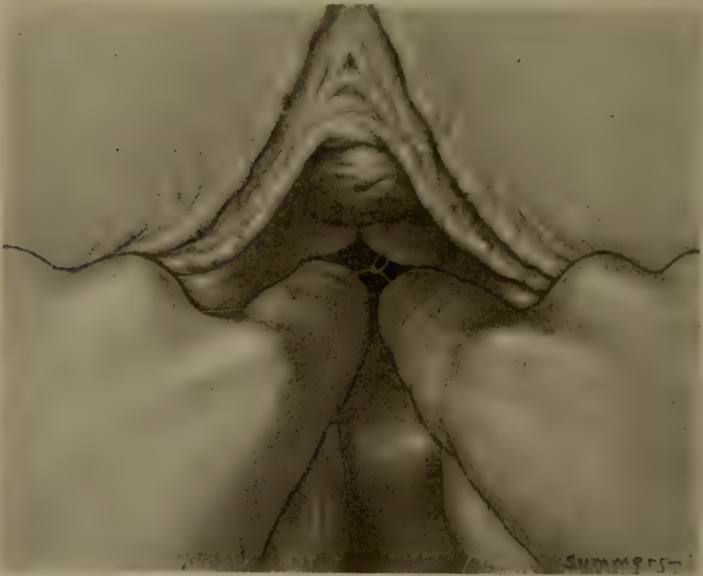

Fig. 710.—The cervix is pushed upward and backward as the sutures are tied.

Comments.—In young women who are expected to bear more children this method restores the anatomic relation to the pelvic organs without interfering with future deliveries. It is more effective than the shortening of the so-called sacro-uterine ligaments, and is much more effective than shortening the round ligaments with perineal repair only. In none of the patients on whom this operation has been done has there been difficulties in subsequent labors.

TRAUMATIC ANEURYSM OF THE FIRST PART OF THE SUBCLAVIAN ARTERY. FAILURE OF CURE AFTER LIGATION OF THE INNOMINATE, VERTEBRAL, AND COMMON CAROTID ARTERIES

MALE aged forty-three. An engineer came in because of a lump on his right shoulder and limitation of motion of right arm and hand and some stiffness.

History (Dr. Carlisle).—December 25, 1921, while driving a car, patient was shot with a 38-caliber revolver. The bullet entered at the top of the sternum and ranged toward the right shoulder. The bullet was removed by a doctor from posterior surface of right shoulder. Following the shooting the right hand dropped from the steering wheel of car and patient was unable to move right arm or hand. The day following a mass appeared on the right shoulder. This mass at first was high on the shoulder near his neck, but seems to have moved down toward the shoulder. It has not increased in size. The mass seems to "beat with the heart." At times patient thinks he can hear blood flowing through the mass. From the time of shooting the arm and hand have been useless. He can move the whole hand, but cannot bend the fingers. The hand and arm feel as if they were in a vise. The hand and arm get cold easily and feel stiff. The flesh does not seem sore, but the bones are sore. He feels fine otherwise. Appetite good, bowels regular, and he is gaining in weight.

Examination.—The patient is well nourished and well developed. The skin is warm, moist, smooth, and elastic. No eruptions and no general adenopathy. The pupils are somewhat dilated, but equal, round, regular, and react normally. Nose and ears negative. The mucous membranes are of normal color. Several teeth missing; remaining are poorly preserved, practically all decayed. The tongue is heavily coated and the breath foul. Tonsils are small, embedded, and full of crypts.

There is a bilateral pulsation in neck, especially on the right side. Extending up on to the neck from the right supraclavicular fossa is an enlargement about the size of a small orange, (Figs. 711, 712). Pulsations of this area are synchronous with heart-beat. The mass is firm and smooth, firmly fixed, and somewhat tender on palpation. A definite thrill is felt all over the mass. On auscultation a loud blowing murmur is heard over the mass and down into the infraclavicular fossa and over the precordia. This murmur is synchronous with the systole of the heart. Just above the sternum almost in the midline there is a small scar. There is a healed incision just below the tip of acromion posteriorly. The chest is symmetric, expansion good; breath sounds vesicular, percussion note resonant. No râles. Respiration rate 20. Heart sounds somewhat obscured by a loud late systolic blowing murmur which is heard all over the precordia, but with maximum intensity over the mass in the neck. Heart sounds are regular and rhythmic. Rate 72. Blood-pressure 85/50.

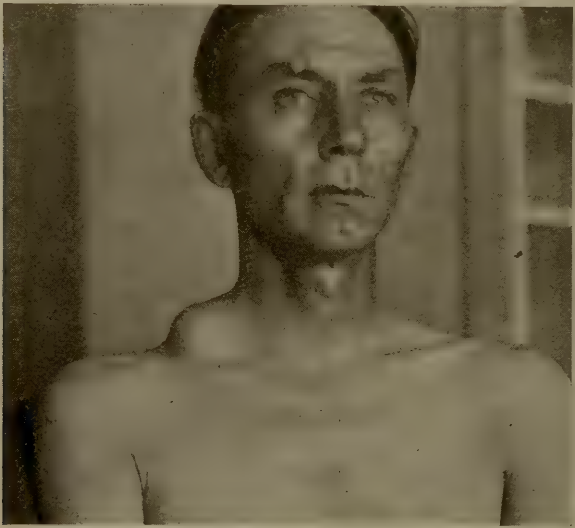

Fig. 711.—Aneurysm of the first position of the subclavian artery before the first operation.

No masses or tenderness in abdomen. Genitalia negative. Both extremities are negative except for some scars on left foot. The reflexes are normal. There is marked atrophy of entire right arm. Skin is glistening and muscles soft and flabby. The forearm and hand look like they had recently been on a flat posterior splint. The elbow can be flexed and extended but slightly, and there is partial flexion and extension at wrist, but practically no movement of the fingers. Nerve area not tested.

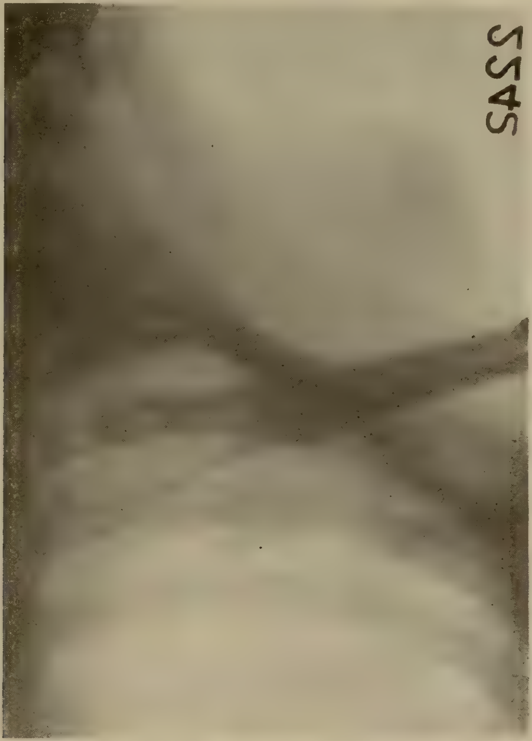

Fig. 712.—*x*-Ray taken before the final operation. (Taken with patient lying face down.)

Diagnosis.—Traumatic aneurysm of right subclavian artery; ischemic and disuse atrophy of right arm and hand. That there is an aneurysm is obvious from the physical examination, and that it is traumatic in origin is evidenced by the history.

Treatment.—Operation (11/24/22): Ether anesthesia. Incision made along the right clavicle from midline outward. The sternocleidomastoid and other overlying muscles were incised. The sternocleidomastoid lay completely over the aneurysm, bisecting it. The sac was found to be much larger than was made out externally. The sac extended to within 1 cm. of the origin of the carotid artery, leaving too small a space for the ligation of the subclavian artery. The innominate artery was therefore dissected free and was ligated with double linen thread just below the bifurcation. The sheath was ligated together with the artery. Ligation caused the mass to cease pulsating. The incised muscles were closed. An iodoform gauze drain was put in. Closure of the skin with silkworm-gut.

Comment.—The inclusion of the sheath of the artery in the ligature was made in order that there would be less likelihood of its cutting through. The recurrent laryngeal nerve was not identified, but care was taken to keep as close to the sheath as possible in order to avoid it.

After-course.—There was no vomiting following operation. Some headache. The gauze drain was removed by Dr. Chesky on the second day. Temperature went to 101° F., pulse 80 the first day. The subsequent course was uneventful.

12/24/22: The patient was dismissed. Wound well healed. No pulsations over the site of the aneurysm. Right arm and hand still numb at times, but, in general, is improved. No pulse made out in right arm. General condition markedly improved. Patient is to return for observation.

Re-entry.—January 8, 1923 the patient returned for further observation. His condition, he states, has been good since leaving the hospital; has had very little trouble with the right arm. On January 4th he was seen by his home physician, and a pulsation at the site of the old aneurysm was noticed.

At the site of the old aneurysmal sac there is a slight pulsation. On auscultation a loud murmur is heard over this area and transmitted down over the whole precordia. The murmur is systolic in time. Old incision is well healed. Heart and lungs negative.

Diagnosis.—Essential aneurysm resulting through collateral circulation into old aneurysmal sac.

Re-operation.—1/13/23: Novocain anesthesia. Incision was made along the outer border of the right sternomastoid muscle. The common carotid and the vertebral arteries were ligated. The common carotid was ligated because it could not be told with certainty whether or not it was contributing to the pulsation. The vertebral was large and pulsated violently. A marked diminution in the pulsation in the old sac was noted, but it did not cease completely as after the first operation. A superficial gauze drain was put in. Closure with silkworm-gut.

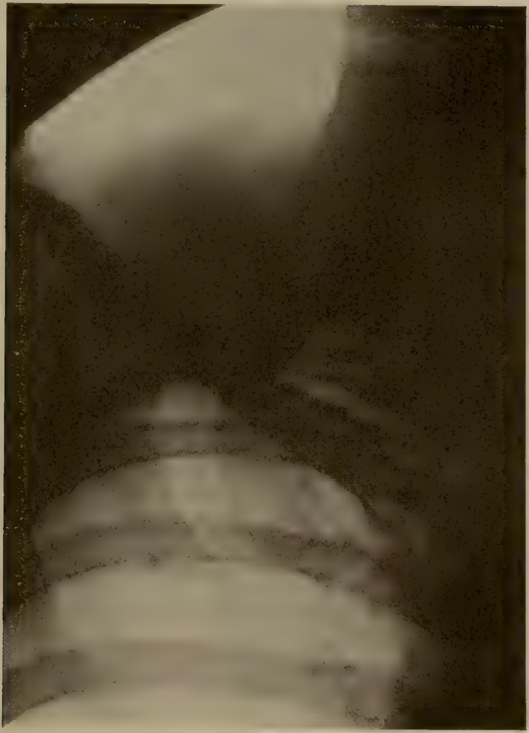

Fig. 713.—*x*-Ray taken after last operation. (Taken with patient lying on his back.)

After-course.—1/14/23: Temperature 99.8° F., pulse 95.

Feels very comfortable. Coughing some and has some pain in neck. Throat very dry and cannot swallow well.

1/16/23: Feeling some better the past two days. Wound dressed, gauze drain removed. Wound well healed. Subsequent course uneventful.

Dismissed 1/29/23. Still a visible pulsation in old aneurysmal sac. Ligation of the third portion of the subclavian artery was advised, but the patient was not willing to submit to further operative interference.

6/16/23: The patient returned for observation. The aneurysm has increased slightly in size. There is a general improvement in all the functions of the arm and hand. The *x*-ray shows the aneurysm to be about the size of an egg (Fig. 713).

Summary.—The complete collapse after the first operation led me to hope that the cure would be permanent. Its failure to completely collapse after the second operation made it apparent that the sac was receiving blood from another source and that further operation would be necessary. That the collateral circulation had been adequately restored was evident from the good pulsations of the radial and ulnar arteries.

In view of the fact that the chief source of postoperative disaster has been in the cutting through of the ligature, I believe it is good judgment to include the sheath with the vessel. There is danger of including the recurrent nerve, but a paralyzed vocal cord is a small handicap to an individual whose disabilities require so formidable an operation as the ligation of the innominate artery.

BILATERAL NEPHROLITHIASIS; OPERATION UNDER LOCAL ANESTHESIA

WOMAN aged fifty-nine came to the hospital for the relief from kidney stones.

History (W. W. Holley).—After the birth of her last child twelve years ago she was seized, eleven days after delivery, by a severe chill followed by nausea and vomiting. Following this she had a dull heavy pain, lasting five days, under her short ribs on the left side. She was free from pain then for six weeks, when the same symptoms were repeated. She had similar spells every month or two for six years. She went to Scotland, and after her return was free from trouble for three years. Three years ago she had renewed chills and nausea, lasting several hours. Following this she had mild attacks about every month. She consulted a distinguished urologist, who told her she had large stones in both kidneys, that the left kidney was abscessed, and that her condition was such that operation would be too dangerous. Since then her troubles have increased. There has been much pus in the urine and sometimes she has passed large amounts of cloudy urine, but there never has been suppression. She has lost some 30 to 40 pounds in weight, but none lately.

Examination.—Physical examination was negative except as follows: deep tenderness in right lower quadrant; reflexes hyperactive. The urine report showed variability, specific gravity 1002–1006. Albumin more than a trace. Red blood-cells numerous, acid, cloudy, many pus-cells. P. S. P. 12 per cent. for two hours.

x-Ray showed large stones in both kidneys (Fig. 714, right kidney; plate of left kidney broken).

Diagnosis.—Obviously stones in both kidneys present the lesion. The large amount of pus, the continued fever, together with the opinion of the urologist previously consulted, indicated a pyonephrosis as well.

Treatment.—Operation (11/1/20): Because of the opinion of the urologist that general anesthesia would be extra hazardous it was decided to operate under local anesthesia. One grain of codein was given as a preliminary hypnotic. Under novocain an incision 8 inches long was made below and parallel with the twelfth rib. The kidney was closely adherent to the surrounding tissues. No attempt was made, therefore, to free it. The lower end was freed and the lower medial border of the pelvis cleared of the surrounding tissues. The pelvis was opened with an electrocautery. Much pus escaped and a number of stones were easily removed (Fig. 715). One being too large for the opening, the lower pole was incised to the depth of 1 inch, also with the cautery. All palpable stones were then removed. A rubber tube was passed into the opening in the pelvis and the wound closed about it. Gauze and a second tube were passed into the cavity below the pole of the kidney.

Fig. 714.—*x*-Ray of the right kidney.

Subsequent Course.—11/2/20: Nausea and vomiting followed the operation; tongue dry; urinary output 3 ounces in first twenty-four hours; much pus. The temperature rose to 104° F. and there was severe headache. After the removal of the gauze and rubber drain below the kidney much urine escaped from the drain in the kidney pelvis. Hot packs and hypodermoclysis were used, 1000 c.c. t. i. d.

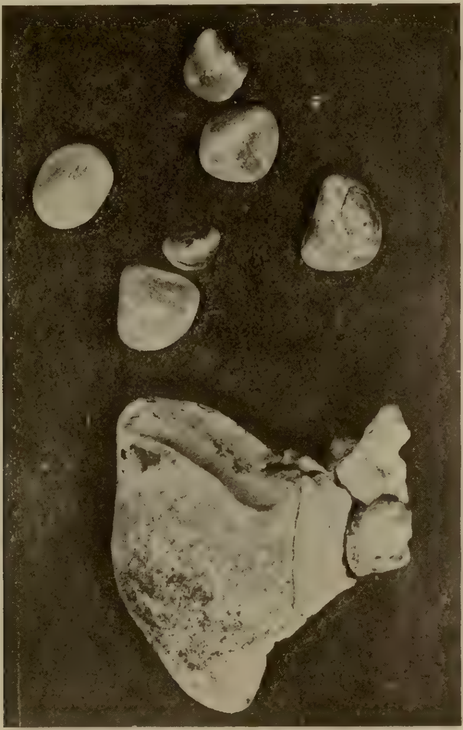

Fig. 715.—Photograph of stones removed from right kidney; the remainder were crushed. (Compare Fig. 714.)

11/10/20: Urine 1008, 12 ounces, much pus. Bloody urine escaping from drainage-tube. Drainage-tube removed (W. W. H.).

11/17/20: Urine 17 ounces, much pus, some red blood-cells. Wound closing; still some drainage.

11/24/20: Urine 40 to 60 ounces in subsequent days. Specific gravity 1008, much pus.

12/9/20: Wound closed. Patient had a chill; temperature 104.2° F., pulse 134, respiration 26. Wound opened. Much purulent urine escaped. Small drain inserted.

12/23/20: Patient dismissed with small drain in wound. *x*-Ray showed that several small stones had been overlooked in the operation.

Re-entry.—6/9/21.

History (J. D. McMillion).—Since the patient left the hospital she has improved a good deal, but still has much pain in the region of the left kidney. There is still a small sinus over the right kidney. She continues to have some fever and much pus in the urine. The *x*-ray shows large stones in the left kidney. P. S. P. first hour, 20 per cent.; second hour, 15 per cent.

Operation.—Under local anesthesia an incision was made in the left loin; muscles severed and kidney capsule opened. The lower pole of the kidney was tilted upward so that the pelvis could be reached from below. The pelvis was as large as a small orange and very tense. When the pelvis was cut into with the cautery foul-smelling pus escaped from the wound. One large stone and three small ones were removed with some difficulty (Fig. 716). A number of smaller stones were crushed in the process of removal. After removal of the stones a large rubber drain was inserted into the pelvis of the kidney and four gauze packs into the upper and lower poles. The wound was then partly closed with catgut and silkworm-gut.

Returned to room in good condition. Proctoclysis started immediately. The immediate afternoon was much less stormy than after the first operation. The pulse ranged between 86 and 100, the temperature ranged around 100° F. for the first week.

6/14/21: Urine 7 ounces. Superficial packing removed from kidney wound (J. D. M.). Very little disturbance of pulse and temperature by the removal of the drain.

6/16/21: Urine 26 ounces. Deep pack removed from kidney today (J. D. M.). Some drainage afterward. Pulse ranges around 86 to 90, temperature has not been above 99.6° F. in past two days.

6/17/21: Feels much better today. Not so much distention. Wound not paining much. Output of urine 40 ounces. Urine clearer.

The next three days the amount of urine varied from 36 to 39 ounces per day.

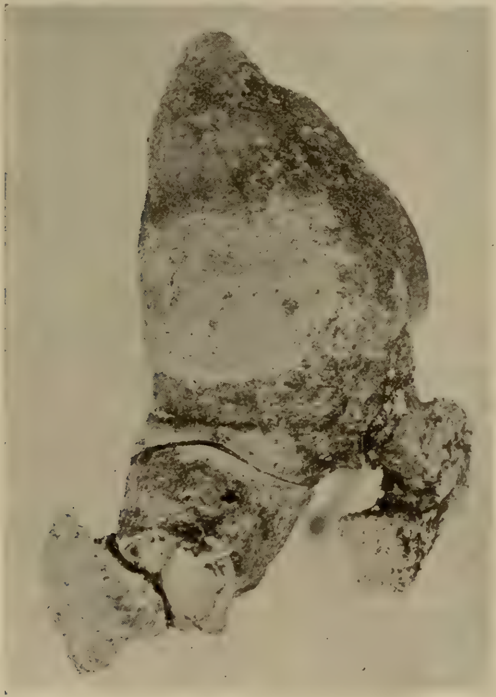

Fig. 716.—Stones removed from the left kidney.

6/26/21: Feeling good; appetite good. General condition good. Still a great deal of purulent drainage from wound.

6/27/21: Sutures removed. Temperature and pulse normal.

7/2/21: P. S. P. first hour, 15 per cent; second hour, 14 per cent. There is quite a bit of drainage from the left kidney. Wound healing nicely. No pain on either side. Drainage still purulent on the left side. Appetite good. Feels fine. The large drainage-tube is to be removed today. Urine output varies from 36 to 52 ounces per day.

7/6/21: Dismissed with small drainage-tube in left kidney region. Still quite a bit of drainage from this side. The small tube is still in the right kidney region. Many pus-cells in urine at time of discharge. General condition improved. Feels fine. *x*-Ray shows several small stones in the right kidney.

Subsequent Course.—She gained 30 pounds in weight during the next six months. When last examined (6/22/23) her health was excellent. There was still pus in the urine and she had some bladder trouble, but the output was about normal.

Comment.—Judging from the reaction following the first operation, a more extended operation would have been exceedingly hazardous. Her health improved after the first operation and the urinary output increased. There was but little reaction following the second operation. Fear of extending the operation over too long a period of time resulted in overlooking several small stones in the first operation. In her present condition if these stones cause any trouble I shall not hesitate to do the regular operation.

The essential feature in doing the operation above described is to get the wound long enough and somewhat lower than the usual incision, so that the lower pole can be more easily reached.

Operating on the kidney without disturbing its location I have found very useful in other conditions, notably, in tuberculosis. In this affection the kidney is not disturbed other than to expose its outer border. The kidney is laid open with the cautery and the tubercular area thoroughly destroyed and the wound in the kidney then packed with iodoform gauze. In this way advanced cases can be operated on when the regular operation would be out of the question.

CLINIC OF DR. THOMAS G. ORR

Bell Memorial Hospital, University of Kansas

A CASE OF LIPOMA MYXOMATODES

This patient has presented himself for amputation for a rather unusual tumor arising in the region of the left popliteal space. He is a coal-miner, thirty-one years of age. He entered this hospital January 19, 1923 complaining of stiffness, pain and swelling of the left knee and thigh.

In May, 1916, while working in a mine, he strained his left leg, which prevented work for two weeks. About three weeks after the injury he noticed a small mass posterior to the knee. This was incised by the mine physician on two different occasions, but no pus obtained. About eight months after the injury his physician began treatment with Coley's serum, which was continued daily for three and a half months, causing at times severe chills and febrile reactions, and resulting in marked loss of weight.

In July, 1917, while the patient was in this hospital, I removed a tumor from the left popliteal space which measured 8 × 10 × 12 cm. It was entirely encapsulated and only adherent to the skin at the sites of former incisions and serum injections and to the periosteum of the posterior surface of the lower femur over an area 4 × 5 cm. Dr. R. H. Major, who was Professor of Pathology at that time, made a diagnosis of lipoma myxomatodes.

About one year after this mass was removed another reappeared in the same location, which, when first noticed, was the size of the end of the patient's thumb. For four years it grew very little. A year ago the tumor began to enlarge rapidly, until now it is larger than the first growth.

Three weeks ago the patient received a lacerated wound of the left leg just above the ankle, which really caused his entrance to the hospital at this time. He had made up his mind before entering that it would be necessary to amputate above the knee to remove the tumor.

Examination at this time shows a mass involving the left popliteal space and surrounding region. It is apparently composed of three or four parts, the largest of which is 10 × 12 cm. in diameter. A broad scar covers the tumor. The consistency is rather soft and elastic. Two or more of the masses are adherent to the old scar, and the entire growth seems to be deeply attached to the lower end of the femur, although it is fairly freely movable. There is a laceration 8 cm. long over the lower third of the tibia which does not concern us today. The *x*-ray, which is here exhibited, shows that there is no evident disease of the bone. In the midst of the tumor mass there is an area about 6 cm. in diameter of less density than the surrounding tissue, which suggests gas or air in the tissues.

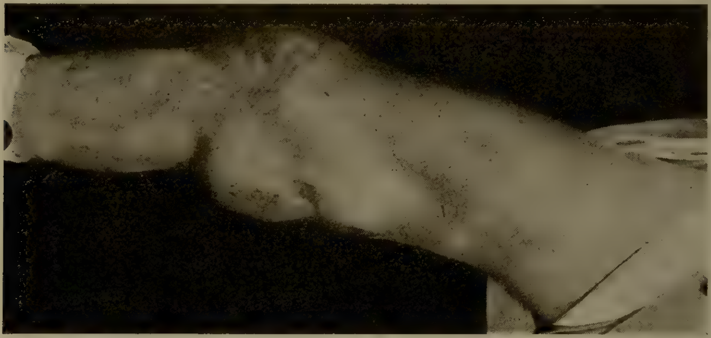

Fig. 717.—Lateral view of tumor arising from popliteal space.

Because of the nature of the tumor and because it has recurred and now involves so much tissue, it is thought best to amputate through the thigh.

We are making long anterior and short posterior skin and deep fascia flaps preparatory to section of the femur in the upper portion of the middle third. The long anterior flap is made to place the scar posterior where it will be least likely to be chafed by the wearing of an artificial limb. The muscles are divided in a circular fashion about 7 or 8 cm. below the point at which the bone is to be severed, so that they may be grouped about the bone and not permitted to retract, leaving the bone protruding beneath the skin and fascia. The periosteum is ringed around with the knife and removed downward for a short distance with the curet. The bone is sawed through 1 cm. distal to the point of removal of the periosteum, leaving the bone end free of covering after the aperiosteal method of Bunge. We draw the nerves down carefully, push the tissues upward from around them, and inject with 95 per cent. alcohol just above the point where they are to be severed. The alcohol injection method has been advocated by Huber and Lewis as the best means of preventing the formation of tender neuromata. All bleeding points are carefully ligated. To group this large mass of thigh muscles about the bone we pass a purse-string suture of heavy chromic gut about their ends and draw them together. This, as usual, does not entirely complete the job, so additional sutures are placed to better group the muscle ends about the bone. Whenever possible the strong intermuscular

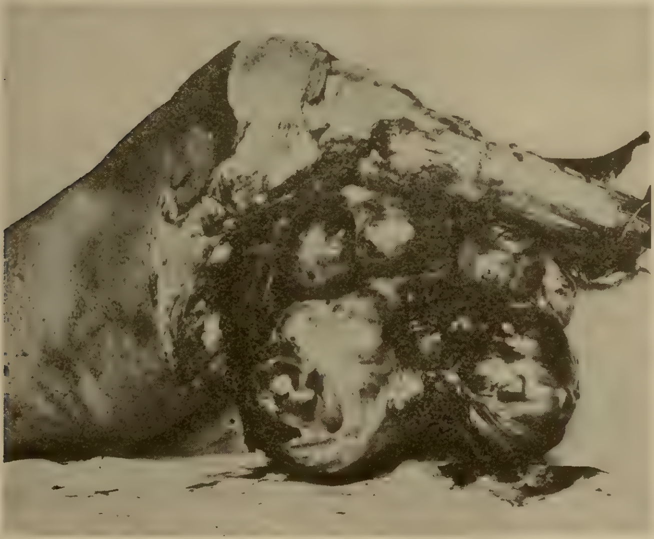

Fig. 718.—Lateral view of tumor with soft parts dissected away.

fascia is used for suturing. You can now see that a muscle-flap has not been made, but all of the thigh muscles have been grouped and puckered about the bone end. It is hoped that this method will give the muscles a new insertion to the end of the bone to prevent its protrusion and increase the function of the thigh. The deep fascia has been included in the skin-flaps. This is sutured in a few places with chromic gut and the skin closed with interrupted silkworm-gut. A small rubber tube drain is placed near each end of the incision between stitches. Drains placed between stitches cause less puckering of the wound after healing than drains at the wound angles. A firm dressing, not too voluminous, is applied.

A report on the pathologist's findings will be made at a later clinic.

Discussion.—In 1857 Virchow first described tumors containing both fat and myxomatous material. He called them "myxoma lipomatodes." Following this others described similar tumors under such terms as "gelatinous and myxosarcoma," "lipoma gelatinosum or mucous tissue fat tumors," "myxolipomatodes" and "lipomyxoma." In 1865 Virchow reported a tumor of the thigh which he called "myxoma lipomatodes malignum." Later "lipoma myxomatodes telangiectatum" and "myxolipoma sarcomatosum telangiectodes" were terms applied to similar tumors.

Since Virchow's description 51 cases of this type of tumor have been described. These have been collected and tabulated in an excellent article by H. E. Robertson, published in 1916 in the Journal of Medical Research. These all conformed in essential respects to the early description of Virchow. The principal characteristics are as follows:

Slow growth (four months to seventy-two years).
Tendency to benignity.
Symptoms usually due to pressure or weight.
Most common between thirty and sixty years of age.
Occasionally sarcomatous.
Usually single.
May reach great size, weighing as much as 50 to 60 pounds.

Develop most frequently in intermuscular fascias of lower limbs and in retroperitoneal space.

Consistency varies from dense fibrous tissues to soft jelly-like masses.

Usually globular in form, with tendency to encapsulation.

The color is grayish white and yellow, with brownish and reddish areas.

On section, lipomatous, gelatinous, fibrous, and at times whitish friable brain-like tissue are present.

The following is the pathologic report made by Dr. H. R. Wahl:

Gross Pathology.—On the posterior and outer surface of the knee there is an oval, somewhat lobulated mass projecting above the surface of the skin about 4 cm. and measuring 11½ cm. in length and 10 cm. in width. The circumference of the knee through the patella is 55 cm. At the junction of the middle and upper thirds of this mass and on its posterior surface there is an irregular poorly defined star-shaped scar measuring approximately 4 cm. in diameter. Beneath the scar the skin is not adherent to the mass, which seems to extend forward and upward a considerable distance between the muscles.

On removal of the skin and the muscles the mass is made up of a large number of irregular but well encapsulated lobules measuring from 1 to 9 cm. in diameter, separated by bands of fibrous tissue. These various lobules seem to penetrate between individual muscle-fibers. The tumor is well encapsulated in every place. The entire mass is rather soft, but is firmly attached to the periosteum on the under surface of the distal end of the femur. This lobulated mass measures 29 × 13 × 11 cm. Most of the lobules have a smooth outer surface, some are rather pale yellow in color and resemble lipomatous lobules, though in some places there are irregular patches of red or dark blue suggesting old hemorrhage. On palpation the lobules are rather soft and boggy in consistency and apparently of a semi-fluid nature. On section, they cut very readily and the cut surface has in most places a homogeneous appearance. They vary, however, in different areas. In some they have a translucent, gray, jelly-like consistency, and in other places they have a rather pale yellow color and resemble a section through butter.

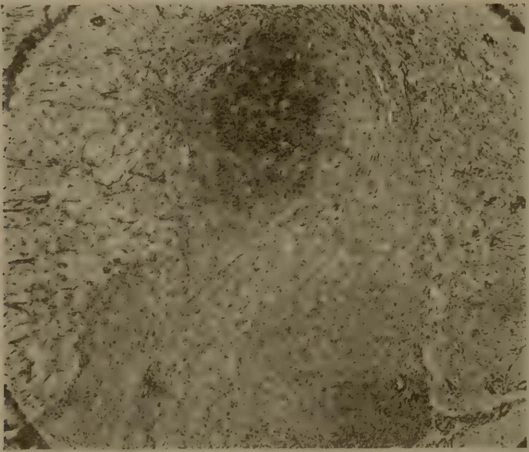

Fig. 719.—Myxomatous tissue containing cartilage.

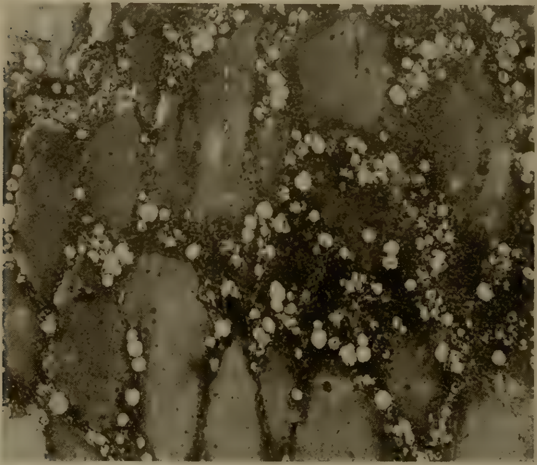

Fig. 720.—Myxomatous tissue containing embryonic fat cells and large spaces filled with mucoid material.

Some areas resemble a section through the gray matter of the brain, others the white matter. Small hemorrhages may be seen throughout the cut surface of the jelly-like areas which are fairly firm and rubbery in consistency, the outer surface only presenting a gelatinous appearance. Some of these lobules have a definite edematous appearance. However, on pressure upon the cut surface very little fluid can be expressed, and this has a greasy feel. Poorly defined streaks of small opaque white tissue may be seen extending throughout the gelatinous tissue.

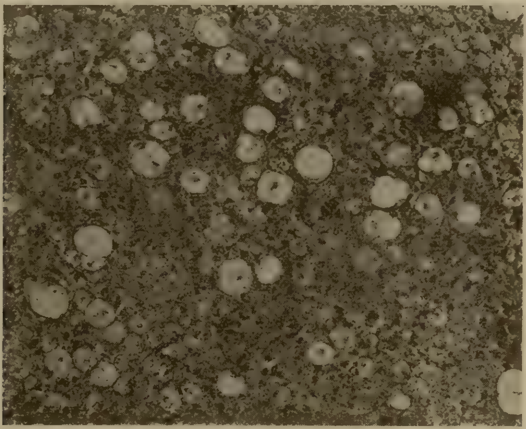

Fig. 721.—Myxomatous tissue containing numerous embryonic fat cells showing a finely vacuolated cytoplasm resembling the so-called "foam cells."

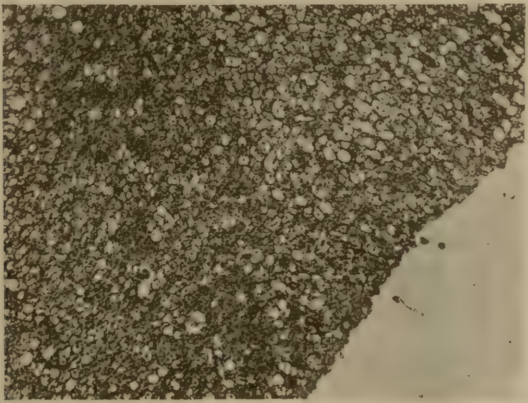

Fig. 722.—Myxomatous tissue showing abundant embryonic fat.

There are some foci of dense fibrous tissue and small areas of cartilaginous tissue.

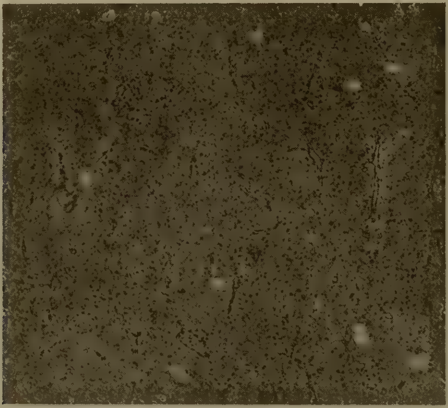

Fig. 723.—Medullary tissue resembling the supporting structure of the gray matter of cerebral cortex. It contains many newly formed capillaries.

Histologic Pathology.—The microscopic picture in various portions of the tumor presents marked variations. Most of the areas that appear like fat in the gross are not normal fat, but rather represent masses of incompletely developed fat cells

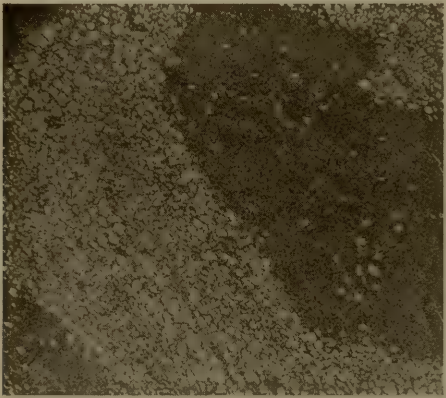

Fig. 724.—Fat and medullary tissue. The latter is apparently a transformation of a myxomatous character.

in which the fat is present in numerous small droplets instead of one large globule. There are all gradations between the fairly mature fat cell and the embryonic type of fat tissue. These various gradations may be seen even in a single section. In many of the foci the cells are made up not of embryonic fat cells, but of large pale so-called "foam" cells, in which the cytoplasm is composed of numerous very small vacuoles uniform in size and a nucleus often pushed to one side, presenting a picture that is typically found in the xanthoma. These xanthomatous areas are very striking. In other foci the tissue has a very peculiar appearance. It suggests, under low power, neurogliar tissue. However, on high-power examination the nuclei are found embedded in a fibrillar syncytium in which there are scattered large typical xanthoma cells. This tissue is quite vascular. Hemorrhages are frequently present. Myxomatous tissue is abundant. In other areas there are all gradations, from loose fibrillar myxomatous tissue to small foci of cartilage. In some areas there are clusters of large rounded or irregular cells containing brown pigment granules. They are only scattered here and there and do not suggest a neoplastic growth.

In other foci there are large irregular but fairly sharply defined spaces separated from each other by strands of embryonic fat or xanthoma-like tissue. These spaces contain a mucoid substance. Some of the spaces are lined by flattened endothelial cells, suggesting dilated lymph-vessels. In most of these, however, no living cells could be recognized. The tissue between some of the spaces is frequently quite cellular, suggesting a sarcomatous growth. Most of these cells tend to be elongated or spindle shaped. No mitotic figures were found.

The periphery of most of the tumor nodules shows complete encapsulation. There is relatively little inflammatory reaction. There is, however, considerable hemorrhage present in different sections. Furthermore, there are some definite areas of necrosis particularly in the neighborhood of the hemorrhages. A few foci of lymphoid cells may be seen about some of the thin-walled blood spaces.

Microchemical Note.—Study of various areas by microchemical methods, such as polarized light, sudan III, and Nile-blue sulphate, indicates that much of the tissue, particularly the lipomatous areas, is composed of neutral fat present as single large globules and small fine droplets both within and without the cells. In some areas, particularly the medullary and xanthomatous portions, where the "foam" cells are abundant, cholesterin compounds evidently predominate. There is no evidence of the presence of fatty acids, lecithin, or phosphatids.

Diagnosis.—Lipoma myxomatodes.

APPENDECTOMY WITH LOCAL ANESTHESIA

THIS case is presented as an interval appendectomy to be done with local anesthesia.

The patient is a nurse in training who was admitted to this hospital July 22, 1921, with a history of six attacks of appendicitis. Four years ago she had the first trouble, the symptoms of which correspond to a moderately severe acute appendicitis. Since then at five different times she has had similar attacks. There has been an almost constant tenderness during this time over the cecal region and there is some tenderness today on deep palpation. There is no other indication of disease.

She has elected to have her appendix removed with local anesthesia during an interval between attacks.

The skin is first infiltrated with novocain solution from the level of the umbilicus downward about 8 to 10 cm. internal to the semilunar line. The skin incision is made and the abdominal wall infiltrated through this incision. The subcutaneous tissues are first injected around the entire wound. The most important trunks of the sensory nerves lie beneath the deep fascia, and the infiltrating needle is thrust through the deep fascia and a small quantity of the solution injected around the wound in a systematic manner. Injections are then made in the midline down through the rectus muscle to and into the posterior sheath of the rectus. After the lapse of a few moments the rectus fascia is incised and the rectus muscle retracted medially from the gutter between its sheaths after the method of Battle. During this process one or more nerves with accompanying artery and vein will be exposed passing beneath the rectus. These can usually be retracted up or down to avoid cutting. If anesthesia is not complete, a few injections may be made along the deep portion of the fascial gutter. The peritoneum is then opened for a distance of about 5 to 6 cm., lifted with forceps, and a circular injection made with a small quantity of the solution from the peritoneal side just beneath the peritoneum. This injection is made to avoid pain that might be produced by traction on the peritoneum about the opening.

The cecum is found and carefully lifted with as little traction as possible. You will notice that it is rolled up with smooth

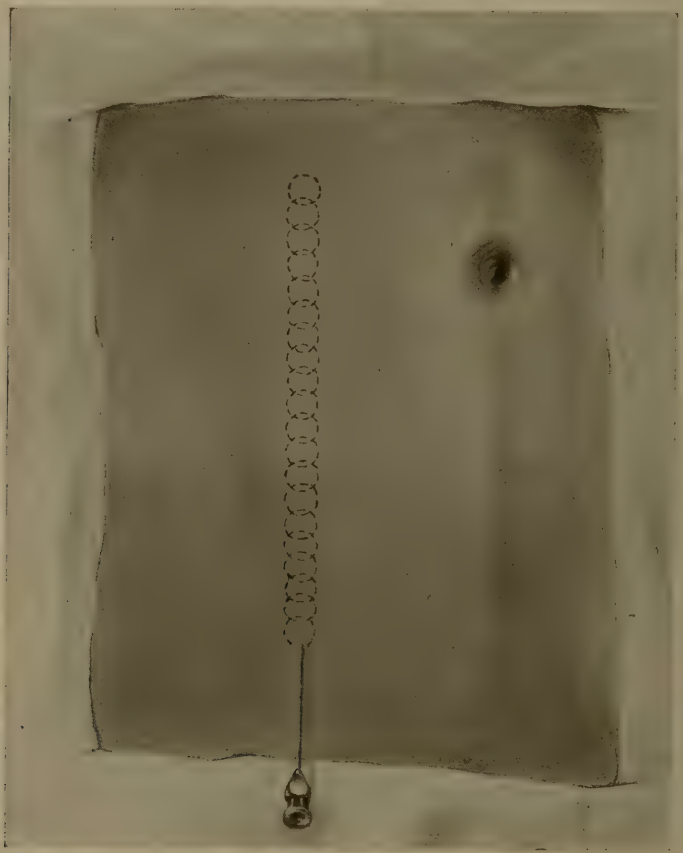

Fig. 725.—Showing infiltration of the skin for Battle incision.

forceps rather than really lifted. As soon as the appendix is found it is fixed at the base with a clamp and the meso-appendix infiltrated with the anesthetic solution. It is then removed by the ordinary method of ligating the meso-appendix and inverting the stump. The patient has complained of some colicky pains referred to the epigastrium, but these have not been severe. Care should be used in making traction on the abdominal wall or viscera. I have had patients complain of pain when a retractor was introduced into the wound, the blade of which made pressure upon the parietal peritoneum beyond the infiltrated area. This should be carefully watched.

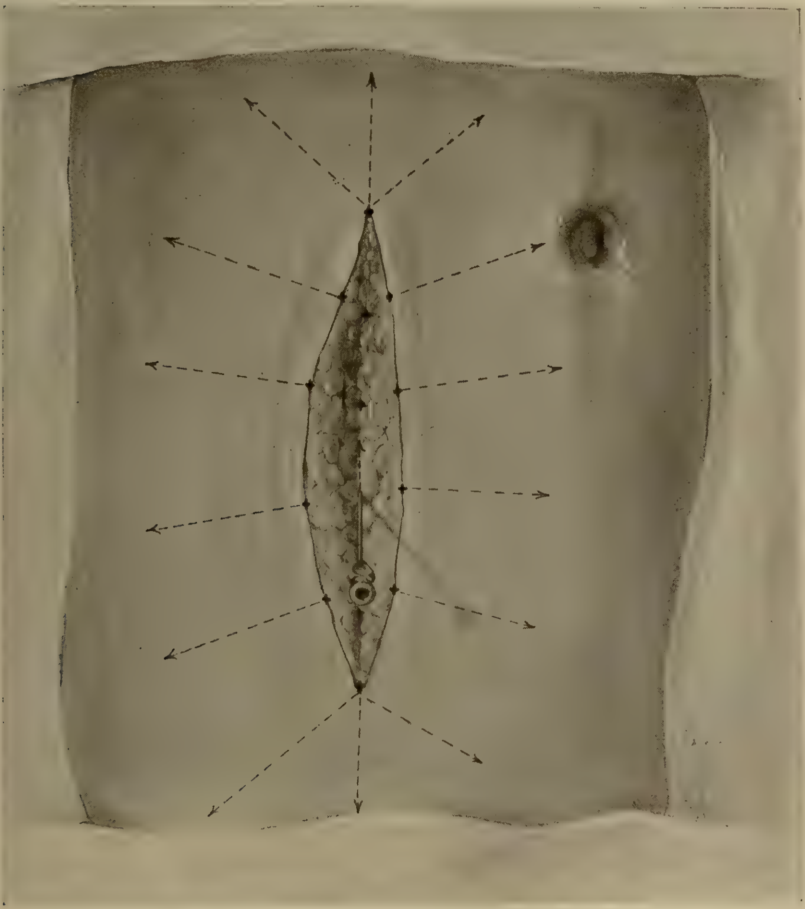

Fig. 726.—Infiltration of the subcutaneous tissues.

The wound is closed with plain gut in the posterior peritoneofascial layer, placing serous surface of the peritoneum to serous surface. The muscle is then replaced in the gutter with three or four interrupted plain gut stitches tied without tension on the muscle tissue. The fascia over the muscle is closed with continuous No. 2 chromic gut, the superficial fascia with plain gut, and the skin with silk.

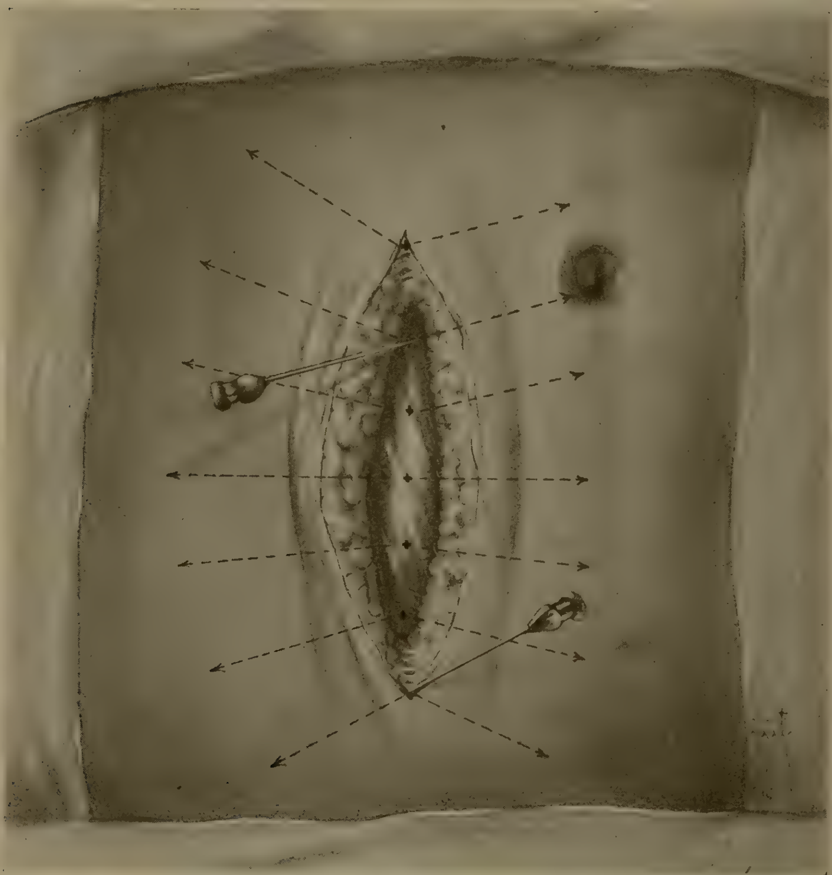

Fig. 727.—Infiltration beneath the deep fascia and through the muscle to peritoneum.

Discussion.—The technic of appendectomy with local anesthesia should be familiar to every surgeon. One frequently finds it indicated. It may be used in a large percentage of interval appendectomies as a matter of choice either of the patient or surgeon. The simple procedure used today has proved very satisfactory. We have used it very extensively in the case of soldiers who have lung disease, either tuberculosis or following gas inhalation in France.

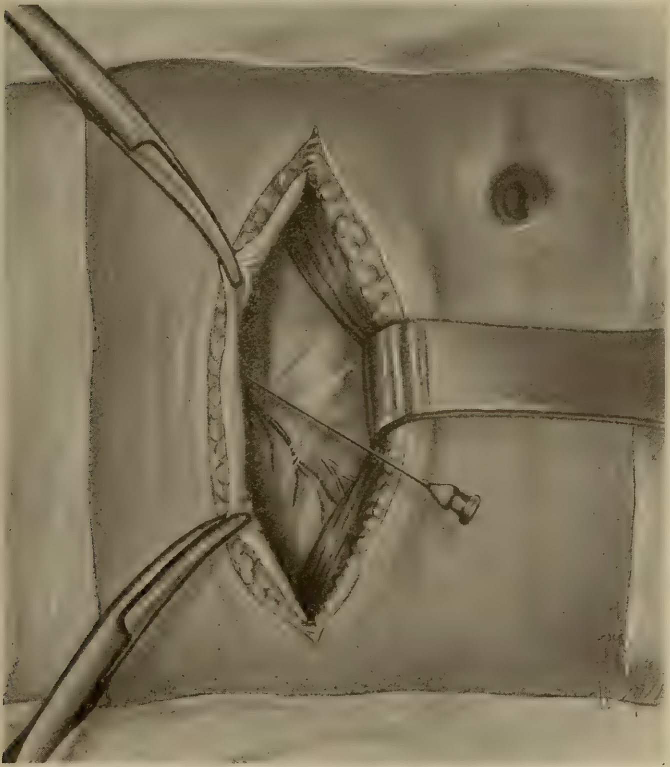

Fig. 728.—Rectus muscle retracted toward midline. Anesthetic is at times necessary along the fascial gutter.

The anesthetic used is ½ per cent. novocain with 1 drop of adrenalin solution to 5 c.c. of the novocain solution. This gives complete anesthesia and can be used in comparatively large quantities if necessary. The quantity we use varies from 30 to 50 c.c.

Pain is rarely severe. Some of the patients complain of colicky pain which radiates to the epigastrium similar to a beginning attack of acute appendicitis. Traction on the gut and its mesentery is avoided as much as possible. As soon as the abdomen is opened the cecum is gently grasped either with gauze or sponge forceps, and rolled up rather than pulled up into the wound. This will usually expose the base of the appendix and often the tip. Before ligating the meso-appendix it is carefully infiltrated with the anesthetic. If thought necessary, some of

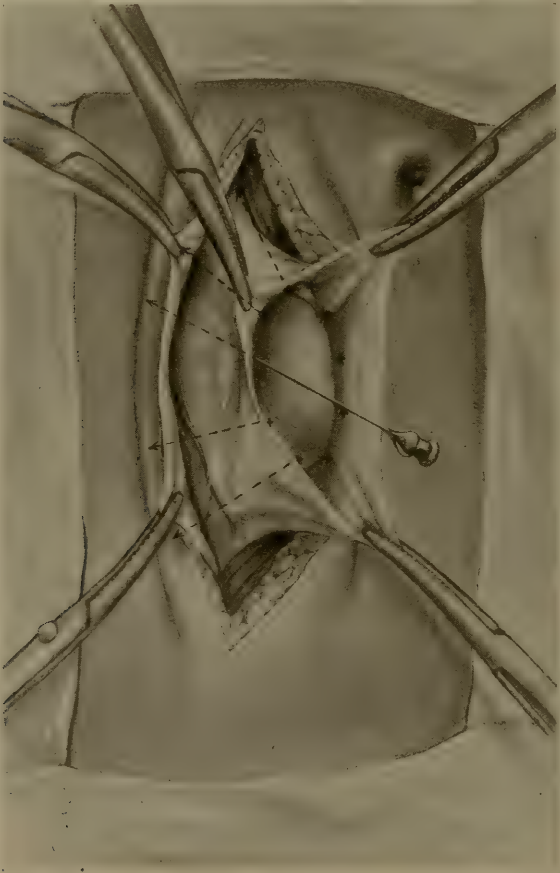

Fig. 729.—Infiltration of the peritoneum around the opening with small quantities introduced from the peritoneal surface.

the anesthetic solution may be injected into the parietal attachments of the cecum to block its nerve supply.

Traction on the abdominal wall should be reduced to a minimum, and all the tissues should be handled with extreme care.

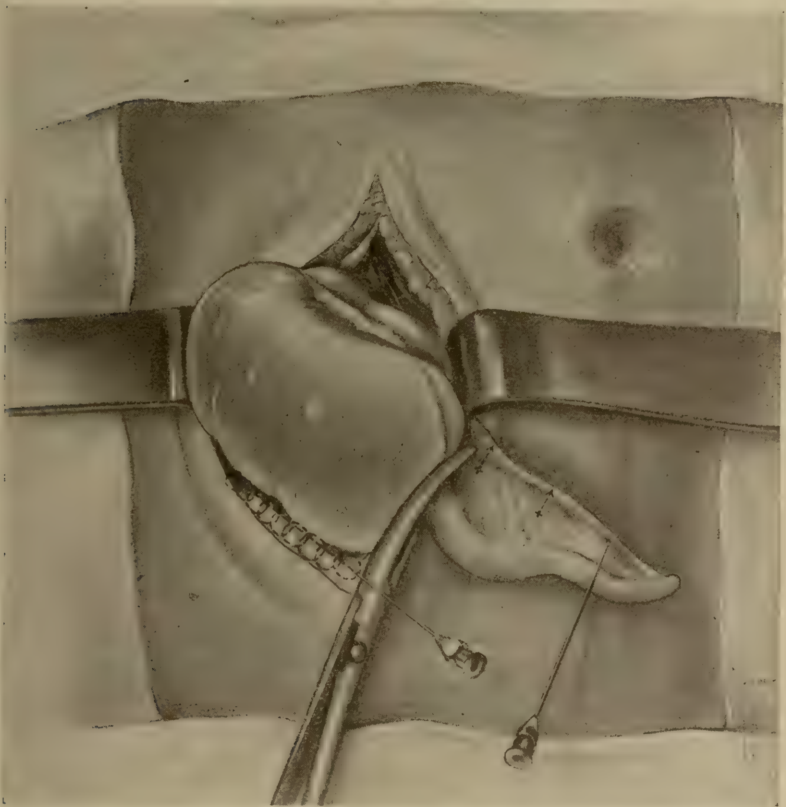

Fig. 730.—Cecum and appendix exposed showing sites for infiltration.

Careful hemostasis is important after the use of adrenalin. Wounds such as these appear to heal just as well and as promptly as those done under general anesthesia.

Patients are almost universally pleased after the operation. Nausea, vomiting, abdominal distention, gas-pains, and thirst are reduced. The patient is usually very comfortable the day following operation.

ELEPHANTIASIS NOSTRAS OF THE GENITALIA. REPORT OF A CASE AND AN OPERATIVE TECHNIC

THE case for presentation today had an amputation of the scrotum three weeks ago for elephantiasis. The history is as follows: The patient, a mulatto thirty-one years of age, was admitted to the Bell Memorial Hospital April 12, 1921, complaining of difficulty of urination, loss of sexual function, and swelling of the scrotum and penis.

About fourteen years ago he had gonorrhea and double bubo. Thirteen years ago he began to have symptoms of a stricture, and was treated with sounds.

He dates the onset of this trouble from an injury received to the scrotum by a machine-gun tripod while in France in 1917. At that time the injury was not severe and he did not discontinue work. Two months later he noticed that the scrotum began to enlarge. This has steadily increased in size up to the present time. Four years ago he noticed that the old stricture was again closing. One year previous to admission to the hospital he developed an abscess in the perineum, which opened and discharged foul-smelling pus. Since that time he has passed some urine through this opening. There is at present a loss of sexual function, the weight and size of the penis forbidding erection.

The examination on admission showed that his general physical condition was good except that he appeared slightly anemic. There was a marked enlargement of both the scrotum and penis. The pores of the skin covering the scrotum stood out prominently and there was some irregularity in the skin surface. There were three open fistulæ on the posterior surface of the mass. On palpation the scrotal tissue was firm and had a brawny feel. The distal portion of the penis also showed this brawny swelling, but at its base the skin and subcutaneous tissues were softer and more or less resembled ordinary edema. The scrotum measured 28 inches at its greatest circumference. When the patient was standing the lower portion of the scrotum and penis measured respectively 12 and 11 inches below the symphysis. The greatest circumference of the penis was 7 inches. The testicles could not be felt. On each side of the scrotum just below the pubes were areas which fluctuated, suggesting fluid. In each inguinal region there was a definite scar of the former bubos.

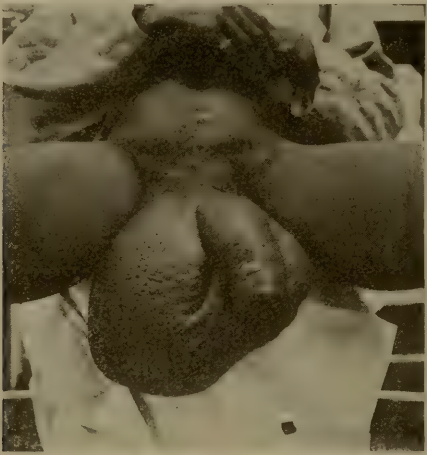
Fig. 731.—Elephantiasis of penis and scrotum.

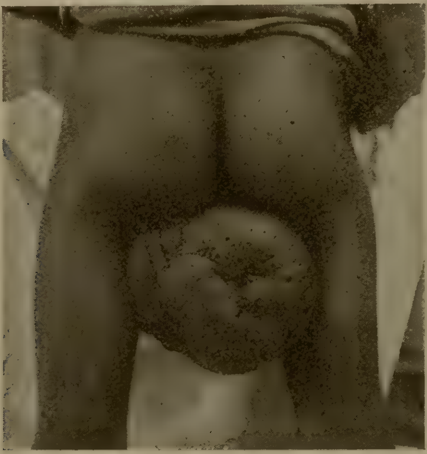
Fig. 732.—Elephantiasis of scrotum—rear view.

The Wassermann was 2 plus. The urine was negative except for a few pus-cells. The hemoglobin was 60 per cent. Examination for filaria at night was negative. Operation was advised and accepted.

On May 5, 1921, under ether anesthesia, the scrotum was amputated. A tourniquet of rubber tubing was placed about the base of the scrotum and held in place by safety-pins through the tube and skin. Three urinary fistulæ were encountered in the mass, all leading to the region of the bulbous urethra. Both testicles were found in normal position in each side of the upper scrotum and were normal in size. They were pushed upward from the wound and the tunica was not opened. When the incision was made through the skin of the scrotum there was an abundant flow of lymph. All the diseased tissues could not be removed, but a great portion of the mass with the exception of that about the base of the penis and perineum was amputated. No operation was done on the penis. The wound was closed with rubber tube drainage. A slight infection in one end of the wound occurred, but cleared up very promptly. In three weeks the wound was entirely healed except a sinus at the site of the drainage-tube. Dr. H. R. Wahl examined the tissue removed, which

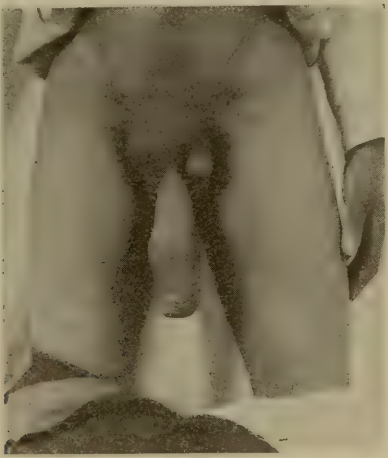

Fig. 733.—Appearance four weeks after second operation.

weighed 4600 grams. His pathologic diagnosis was "elephantiasis of the scrotum with chronic sinuses."

Three weeks have passed since the scrotum was amputated. During this time we have endeavored to work out an application in this case for the Kondoleon principle of an anastomosis between the deep and superficial lymphatics. It is evident that the glans and body of the penis, testicles, and cords are not involved in the process. In studying the anatomy of this region I find that these structures are drained entirely by the deep lymphatics, and that here apparently the superficial lymphatics only are involved. With this in mind, an operation was planned by which the testicles and cords are to be transplanted beneath the skin and superficial fascia, with the hope that such a procedure will promote drainage of the lymphatics of the penis and the remaining base of the scrotum.

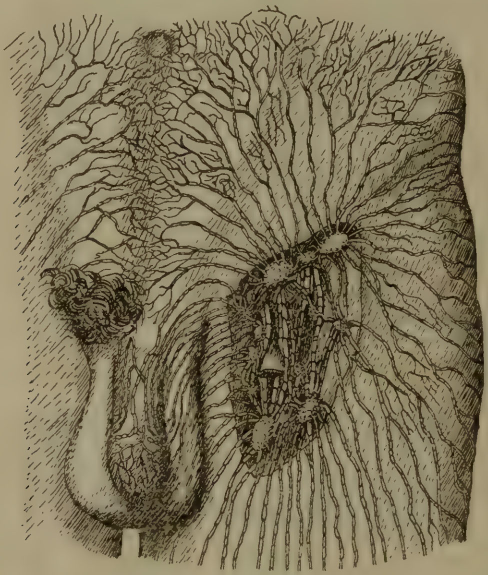

Fig. 734.—Glands and lymph-vessels of the inguinal region. Shows superficial lymphatics of scrotum and penis draining into glands. (After Sappey.)

We shall make an incision as for the ordinary inguinal hernia. The external oblique is divided to a point external to the internal ring and the cord lifted. To strengthen the abdominal wall the internal oblique is sutured to Poupart's ligament as in the ordinary hernia operation. The testicle is drawn up into the incision. The tunica vaginalis is opened, turned inside out, and sutured behind the cord and upper epididymis. This is then replaced with the testicle against the subcutaneous tissues of the upper scrotum. A stitch is placed in the external oblique beneath the cord. The cord and testicle then both lie beneath the skin and superficial fascia, which is now closed over them. The skin is sutured with continuous silk. You can see that there is some possibility here of an anastomosis between the deep and superficial lymphatics. The deep lymphatics drain the testicles and cord, and the superficial lymphatics drain the skin.

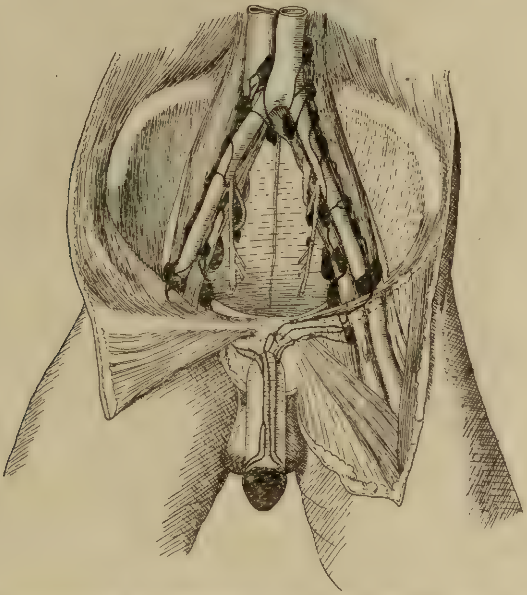

Fig. 735.—Lymphatics of glans penis drain into deep glands along the iliac vessels. (After Cunéo and Marcille.)

On the right side the same procedure is carried out.

It is planned to do a circumcision under a local anesthetic at some future time, as soon as the maximum shrinkage of the tissues has taken place.

Discussion.—The elephantiasis in this case has evidently been produced by the double bubos, stricture, and the accompanying inflammation. Filariasis, the common etiologic factor in tropical countries, is not necessary for the development of this disease. Any obstruction to the lymphatics with resulting lymph edema and inflammation may be the cause. It is more common in the males of the negro race.

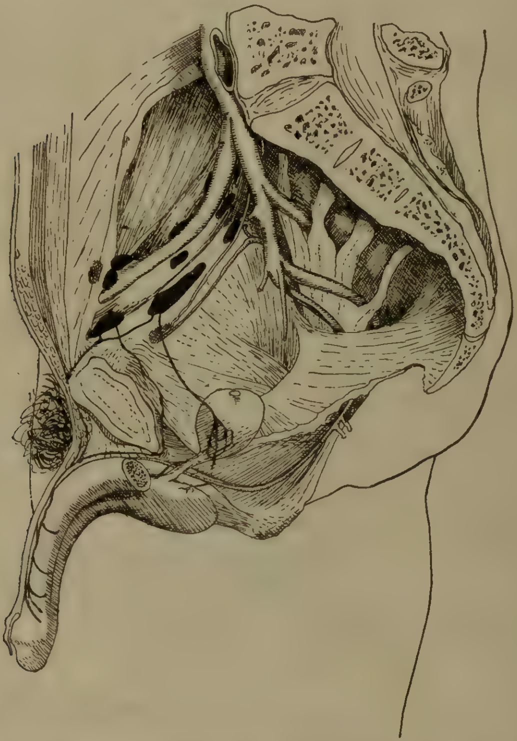

Fig. 736.—Lymphatics and penile and membranous portions of the urethra drain into deep iliac glands. (After Cunéo and Marcille.)

It may affect the leg, arm, genitalia, breast, lip, face, or scalp. It is most common in the leg, examples of which are not uncommon.

The pathology is characterized by a chronic inflammatory fibromatosis or hypertrophy of the hypodermal or dermal connective tissues. There is a brawny induration of the skin. On section, there appears a lymphangiectasis, hemangiectasis, hyperplasia of the connective tissue, and chronic edema. When the tissue is cut there is usually an abundant flow of lymph. Bleeding may also be profuse due to dilatation of the veins.

The treatment up to the present time for this condition has been amputation of the scrotum and, if necessary, a plastic operation upon the penis.

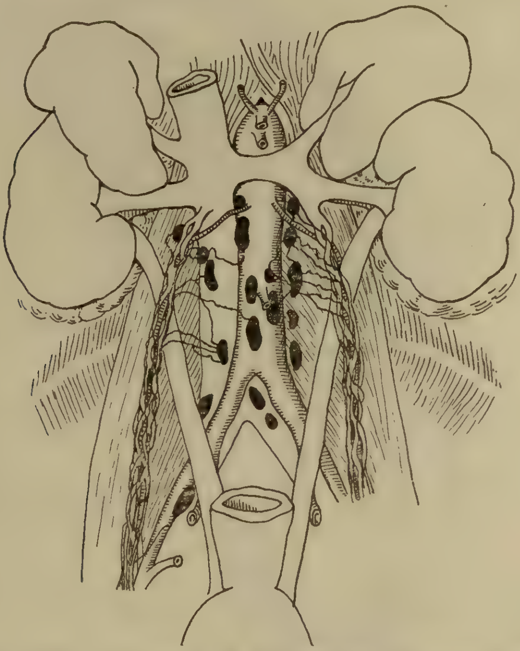

Fig. 737.—The lymphatics of the testicle, epididymis, and visceral layer of the tunica vaginalis pass along the spermatic cord and drain into the glands of the lumbar region. (After Poirier, Cunéo, and Delamere.)

Summary.—This seems to be very definitely a case of sporadic elephantiasis of the scrotum and penis due to infection of the inguinal glands and peri-urethral infection following stricture.

The treatment of these cases is always surgical. This has been abundantly proved in the past.

The operative technic first used in this case was to remove as much of the diseased tissue as possible. The second operation was designed to drain the diseased area and prevent recurrence by removing the barrier between the superficial and deep lymphatics. This method was suggested to me by the Kondoleon operation for elephantiasis of the arm and leg, which is founded upon the principle of an anastomosis between the superficial and deep lymphatics, thus draining the former and reducing the lymph obstruction.

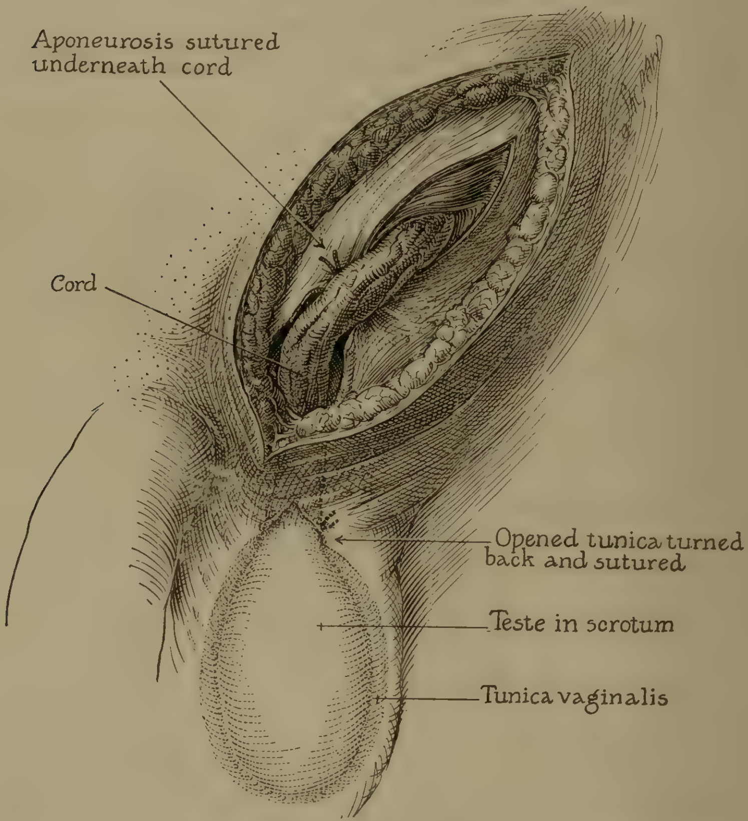
Aponeurosis sutured underneath cord
Cord
Opened tunica turned back and sutured
Teste in scrotum
Tunica vaginalis

Fig. 738.—Sketch showing the cord and testicle transplanted beneath the skin and superficial fascia. The tunica vaginalis has been opened and stitched posterior to cord.

I offer this operative technic as a suggestion only, because it has been used in but this one case as far as I am able to learn.

Judging from the results reported from the Kondoleon operation benefit from this method may be reasonably expected.

Later Notes.—The wounds of the second operation healed *per primam.* After the first operation there appeared to be some diminution in the size of the penis at its base. This was very definitely true four weeks after the second operation. At this time all of the tissues had sufficiently softened to feel the location of the glans above the prepuce. The corpora could be definitely outlined. The patient notified me that erections were now possible, which were not possible before.

In August, 1922, more than a year after the operation, the patient was seen and examined. His condition had so far improved that he did not care to return for further surgery. There was still some enlargement of the skin and subcutaneous tissues of the penis, which was more marked after standing during the day. The foreskin could be retracted from the glans with ease. He was at that time in possession of full sexual power and function and considered circumcision unnecessary

CLINIC OF DRS. W. J. FRICK AND R. D. IRLAND

RESEARCH HOSPITAL

VON RECKLINGHAUSEN'S DISEASE

THIS is a startling case (Fig. 739). It fastens itself on one's attention at a glance. Before it came to us neither of us had seen anything like it. The patient, a woman fifty-nine years old, single, has a strong strain of Indian ancestry, is small, slender,

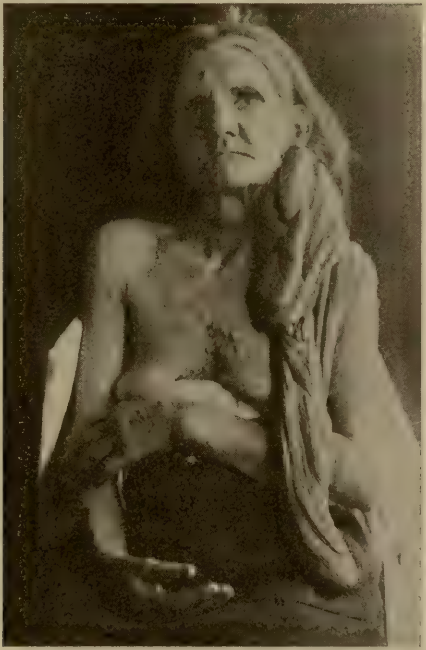

Fig. 739.—Von Recklinghausen's disease.

uneducated, but intelligent. Feels well, but is annoyed by the growing mass at the base of her neck; there is no pain, and the mass is not tender; it has been growing rapidly for the last month or two, and is beginning to prevent lateral flexion of the neck toward the left; there is no respiratory difficulty or cardiac disturbance; digestion and appetite are good. The nodules in the skin have been increasing in number, not so much in size, for many years. There have been no menstrual disorders; an uneventful menopause occurred ten years ago. There has been no illness except measles and whooping-cough early in life.

Physical Examination.—Heart negative; lungs negative to percussion, auscultation, and palpation, but the *x*-ray shows them both studded with shot-like nodules which throw dense shadows. The skin over the entire body and the extremities shows numerous patches of brownish discoloration over rounded cutaneous or subcutaneous tumors which feel like fibrous tissue, are freely movable, and which vary in size from that of a grain of wheat to that of a flattened marble. There is no regularity of distribution of the tumors. At the left side of the base of the neck there is a hard tumor the size of an ostrich egg which seems mobile enough to permit of its removal. From this mass long folds of what feels like fibrous tissue covered with coarse pigmented skin fall in festoons, the longest of which reach below the waist line.

Comment During Operation.—The incision for the removal of the mass is rather more awkward than difficult to make. It must be carried through the skin and subcutaneous tissues to the large mobile mass which we hope will peel out easily. Unfortunately, it does not peel out easily, and in digging it out we have torn through what looks like a capsule, and the tissue of which the tumor is composed looks like sarcoma. We now attend carefully to hemostasis and close the wound with interrupted sutures of fine catgut. For purposes of examination we shall now excise several of these skin nodules from the thigh, closing wounds with catgut sutures.

Note.—Microscopic examination of the tissue removed shows that the neck tumor is a spindle-cell sarcoma. The skin tumors show nothing but fibrous tissue.

This patient must be given x-ray treatment to supplement this operation, for it is not conceivable that we have removed all the tumor, which is undoubtedly malignant in character.

In reading the literature on this case we find that the condition while uncommon is not rare, and is variously spoken of as multiple neurofibromatosis, multiple neuroma, elephantiasis nervorum, and fibroma molluscum. Adrian in 1903 collected 407 cases, and Preiser and Davenport in 1918 state that the disease occurs once in 2000 cases. Von Recklinghausen noted the frequent association of multiple neuromas with cutaneous fibromas, and in his paper published in 1882 he clearly defined the relationship between various manifestations of the disease which has since quite properly borne his name.

Concerning the pathology of the tumors, the thing which seems most definitely established is that they grow from the nerve connective-tissue epineurium, endoneurium, or perineurium. Osler says that they grow from the sheath of Schwann. Trimble is inclined to believe that the tumors are properly classified with the teratomata. In his report of a ventral tumor of the sacrum he has this to say: "Very early in embryonal life the primitive gut and the neural canal are continuous at about the caudal end of the notochord through the medium of the neurenteric canal. On one side of this canal and continuous with it are the entodermal cells, from which are developed the foregut, kidneys, ureter, bladder, etc., and on the other side are the ectodermal cells from which are developed the spinal cord, brain, and nerves. Directly associated with these two groups of cells is a third group, the mesodermal cells, from which are developed the muscles, bones, blood-vessels, and connective tissues. From these three groups of cells differentiated only by individual potentialities are rapidly outlined the various tissues and organs of the body." He believes that these tumors may be cut-offs from these cell masses about the neurenteric canal, and that they may produce any type or combination of types of the body tissues; and further, that nerve elements in the tumors described are not essential to their classification as Von Recklinghausen's disease.

Helmholz and Cushing in their article published in the Amer.

Jour. of Med. Sci., 1906, vol. 132, p. 355, report and picture a number of cases, all of which have tumors chiefly involving the scalp or face. In their own cases they have demonstrated degenerating neurofibrils. Others have demonstrated ganglion cells in these tumors. In many reported cases, including our own, only fibrous tissue has been found. Besides these tumors of the skin and subcutaneous tissue we find the bones are sometimes affected, the condition being known as osteitis fibrosa cystica. The tumors usually are benign, but a tendency to undergo sarcomatous change, as in our own case, has been reported. We have found in the literature no observation of nodules in the lungs, though fibrous tumors in the walls of the intestine and stomach have been reported in one case in which an autopsy was done. We are inclined to consider them as tumors similar to the skin nodules, though it is possible they are metastatic sarcomata. The nodules rarely occur on the soles or palms, but Anderson in the Jour. Amer. Med. Assoc., 1920, vol. 74, p. 1018, pictures a case with tumors on the left sole. Pigmentation of the skin over the tumors is common. Cystic, fatty, and myxomatous degeneration was reported by Von Recklinghausen.

Concerning the etiology little is definitely known. The French and Italians have tried to connect it with endocrine dysfunction, but one should be wary of pitfalls along this route. The few things we do know are: First, that the disease always dates from early childhood. Feindel says it is "always congenital, sometimes hereditary, often familial." Second, that it is about equally frequent among males and females. Third, that the familial tendency is marked. Fourth, that it is uncommon in negroes. Preiser and Davenport, in their paper referred to before (Amer. Jour. Med. Sci., 1918, vol. 156, p. 507), present in an excellent fashion the familial occurrence of many cases. The influence of toxins and traumatism in determining the tumors is noted by many. Typhoid fever, diphtheria, pneumonia, arsenical poisoning, lead-poisoning, puberty, and pregnancy have preceded the appearance of the first tumors or a sudden growth of tumors that have previously existed.

The symptomatology of the disease is varied. Almost any sort of psychic, nervous or trophic disorders, general depression, neurasthenia, muscular contraction, pain which may be intense and radiate along the distribution of the nerve trunks involved, scoliosis, or sexual impotence, may be present.

Later Notes on This Case.—The tumor on the neck recurred and was again removed March 28, 1922. The wound was left wide open so as to give the *x*-ray a better chance at penetration. May 18th she returned with another recurrence larger than the last. The patient became progressively weaker and died June 30, 1922. No autopsy was permitted. The accompanying picture (Fig. 739) imperfectly shows the gross appearance of the tumor.

150m

GASTRIC AND INTESTINAL BLEEDING IN CHRONIC APPENDIX AND GALL-BLADDER DISEASE

In this case we have a manifestation that is uncommon though not rare. Bleeding in the gastro-intestinal tract as an accompaniment of disease of the appendix and the gall-bladder has been reported many times in the literature of America, England, France, Austria, Germany, and Italy. The total number of reported cases, however, is small enough as to make any new case worthy of note.

This patient, referred to us by Dr. Milne, was first seen by us three days ago after a very thorough analysis of her case by Dr. Milne. She complains of pain and tenderness in her right abdomen and gives the following clear history: Her mother and certain others of her family have had liver trouble with jaundice. Her own illnesses, aside from her present trouble, include scarlet fever at ten years, a severe case of "flu" followed by pneumonia three years ago, frequent attacks of tonsillitis until two years ago, when tonsils were removed. Her menstrual history is uninteresting. She has had 7 pregnancies, 4 of which miscarried at about two months, reasons not known. Otherwise the obstetric history is negative except for erysipelas following the birth of her second child.

The story of her present illness goes back thirty-six years, when she was ten years old, and when she had an attack of scarlet fever, after which she was never so strong as she had been. She definitely remembers an attack of epigastric pain with nausea and vomiting when she was fifteen years old. From that time until now she has had a great deal of digestive trouble—pain, nausea, and vomiting. At eighteen years of age there was a profuse gastric hemorrhage following one of these attacks. The same thing occurred when she was twenty years old. Between attacks there were occasional black shining stools. The next hemorrhage occurred when she was thirty two years old. At thirty-six she had the most severe bleeding of her experience; and one year ago, when she was forty-five, the last marked bleeding from the stomach occurred. In every instance the vomiting of blood was preceded or accompanied by epigastric pain and nausea. The pain would sometimes radiate into the right hypochondrium, the right back and scapular region; and several times there has been noticeable jaundice. With the exception of the bleeding this is the ordinary story of associated chronic disease of the appendix and gall-bladder.

The examination reveals a woman forty-six years old, fairly well nourished, and slightly jaundiced. Teeth are in fair condition. There is a deviated septum, the tonsils have been removed. Blood-pressure 130/76. Heart is normal in outline and boundaries and there is no murmur or thrill. Lungs are normal, chest symmetric, expansion good. The nervous system is negative. The abdomen is normal in shape; no palpable masses; no rigidity. There is a marked tenderness in the right hypochondrium and in the right side of the epigastrium; also in the right iliac region and at the right lumbar ganglion. Urine negative. *x*-Ray examination of the gastro-intestinal tract reveals no evidence of pathologic change.

The significant points in the history and physical findings are: (1) That her symptoms of gastro-intestinal disease began soon after scarlet fever, and that from then on she had frequent attacks of tonsillitis until tonsillectomy two years ago. (2) That there have been repeated attacks fairly characteristic of combined appendix and gall-bladder disease. (3) That the character and the relation of the pain and location of the points of maximum tenderness clearly indicate gall-bladder disease. Also the tenderness over the right lumbar ganglion is seldom present in the absence of chronic disease of the ileocecal-appendix region. (4) *x*-Ray examination is negative. (5) Repeated blood Wassermann tests are negative.

We have based our diagnosis of gall-stone and chronic appendix disease on these positive and negative data. Just what is the cause of the gastro-intestinal bleeding we do not know, and we prefer not to speculate on it until having inspected the stomach and duodenum.

Comment During Operation.—We shall use a straight right midrectus incision for the reason that it gives an excellent opportunity to examine all the organs of the upper abdomen; also through it one is nearly always able to inspect the appendix. In this case we are copmelled to lengthen the incision downward in order properly to expose the appendix field. You will see that there is a developmental band reflected from the ileum around the front of the proximal third of the appendix, passing on to the outer layer of the meso-appendix. This anatomic anomaly is sufficient to cause what is commonly, though improperly, called chronic appendicitis. There are no other evidences of appendix disease except that the structure is longer and thicker than usual. We shall divide this band and then remove the appendix, invaginating the stump of it by means of a purse-string suture of No. 0 plain catgut. It may seem antiquated to some of you that we still go to the trouble of invaginating an appendix stump, but we feel just a little safer after having done it.

Palpation of the gall-bladder reveals it somewhat distended and containing a large stone. After packing large sponges about the gall-bladder to protect the adjacent peritoneum from contamination with bile, an opening is made large enough to permit removal of one large mulberry stone. There are no others. We shall suture a rubber tube to the margin of the wound in the gall-bladder and make no effort to invert its edges. The tube acting as a foreign body will have the effect of reversing the lymph-stream in the gall-bladder wall, and so tend to wash out any infectious elements that might otherwise remain there. We believe that a failure to grasp the probability of this effect of the gall-bladder drainage has induced many operators needlessly to sacrifice many gall-bladders.

We now desire to inspect the stomach, duodenum, and intestine for evidence that may explain why the patient has bled so much and so often. The stomach is absolutely normal in every way; it is not enlarged; its walls are not thickened; there are no visible scars in it; and there is not the slightest suggestion of varicosities anywhere. The duodenum is dilated, but there is no evidence of kinking or twisting. Its walls are normal in color and thickness, and there is no evidence of scars in the region near the pylorus or elsewhere.

We shall close the abdominal wall wound in layers without any drainage material other than the tube sutured in the gall-bladder wound. The skin surrounding the wound is anointed thickly with zinc oxid ointment to protect it from the irritating effect of the drainage bile.

Now how is the bleeding in this case to be explained in the absence of varices or ulcers? Woolsey asserts that 2 per cent. of appendicitis cases and about 5 per cent. of gall-bladder infections give a history of gastric bleeding. In our experience this estimate is much too high. There are a great many cases of appendix disease in which practically all the symptoms are referred to the upper abdomen, but by no means have we seen gastric hemorrhage in 2 per cent. of the cases.

Floersheim states that gastric hemorrhage as an accompaniment of appendix and gall-bladder disease seldom shows any pathologic change in the stomach. Kuernwell notes intestinal bleeding as a rare symptom of chronic appendix disease, and asserts that it is usually due to an embolic duodenal ulcer. Judd has called attention to the frequency of associated gall-bladder disease in cases in which the symptomatology indicated only bleeding duodenal ulcer. He specifically mentions one case in which there is no evidence of the source of the bleeding, and suggests that it is due to the presence of toxins in the blood, and that it is to be considered as being analogous to essential hematuria or bleeding from an unbroken nasal mucosa.

We are inclined to agree with this theory of toxemia as the cause of bleeding in such cases as the one before us; and we regard it as extremely significant from an etiologic viewpoint that this patient's history of trouble definitely began with scarlet fever and that repeated attacks of tonsillitis have maintained a more or less intimate time relationship with her gastro-intestinal attacks.

CLINIC OF DR. HARRY R. WAHL

Bell Memorial Hospital

TUBERCULOUS SALPINGITIS

Case I.—A colored woman, aged twenty-six, came into the hospital two weeks ago complaining of sharp shooting pains in the left side beginning three weeks before. The onset of the illness was associated with headaches, fever, and chills. The abdomen became swollen and tender. The patient was compelled to remain in bed for two weeks, but during the week before her admission she was so much improved that she was able to get up and attend to some of her household duties. She has been married three years, but has never been pregnant. There was marked leukorrhea. On physical examination the patient was well nourished and apparently in good health. However, her abdomen was distended and tender, especially over the liver. Vaginal examination showed a tender mass on each side of the cervix. At operation the peritoneal cavity was filled with clear serous fluid and the serous surfaces studded with tubercles throughout the abdominal cavity. The tubes were much enlarged on both sides, appeared inflamed, were covered with tubercles, and were excised. The postoperative course was complicated by annoying gas-pains, flatus, and elevation of the temperature up to 103° F. The temperature, however, gradually returned to normal, and the patient was discharged two weeks after the operation apparently well.

This is one of the tubes that was removed. It is considerably enlarged, measuring 3 cm. in diameter. Its surface is inflamed and covered with tubercles. There are also some patches of fibrin, some of which extend over the surface of the adjacent ovary, otherwise the ovary appears normal. In a cross-section through this tube you will note that the wall is markedly thickened. The normal epithelial folds are obliterated and the lumen practically occluded by a pale yellow, soft, friable, encephaloid tissue showing small caseous foci. The fimbriated end of the tube is open, yet no tubercles are seen along the end and margin of the tube. The tubercles are more abundant near the middle portion of the tube.

This is a microscopic section through the tube, and it shows typical miliary tubercles containing giant-cells in both the folds of the mucosa and in the serosa. Few tubercles could be seen in the muscle layer. This suggests that the tubal condition is probably a direct extension from the peritoneal process which is primary. A large percentage of tuberculous salpingitis, some hold that most of them, become infected from the peritoneum. Such an infection may spread to the tubal mucosa through the fimbriated end or through the lymphatics of the peritoneum. Other authors hold that the tubercle bacilli are swept in or aspirated into the tube just as the ova from the ovary are carried into the tube by currents produced by the movement of the tubal cilia and its muscle layer. The mucosa of the tube is very susceptible to the growth of tubercle bacilli and an extensive endosalpingitis

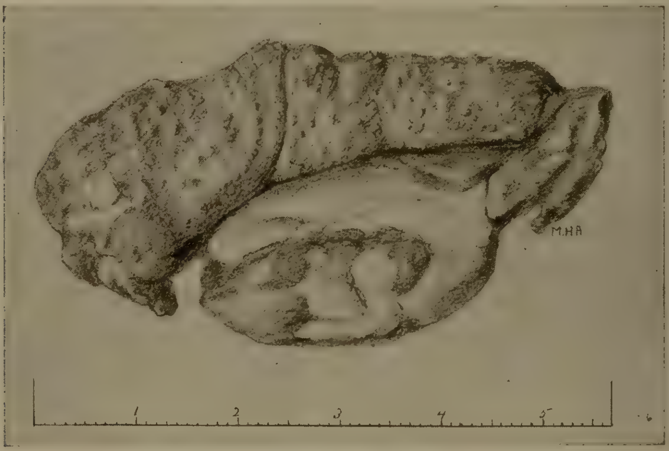

Fig. 740.—Tube from Case I.

results early and soon overshadows the perisalpingitis. While tuberculous salpingitis frequently follows tuberculous peritonitis, the latter rarely follows the former except locally about the fimbriated end of the tube.

One interesting feature of this case is the apparently healthy appearance of the patient in spite of the extensive lesions in the peritoneal cavity and the comparatively uneventful recovery following the salpingectomy.

Case II.—Also a colored woman, aged thirty-one, with a constant dull aching pain in the lower abdomen and back beginning five months ago. This patient was married one year ago, but has never been pregnant. She has leukorrhea and painful micturition. The physical examination showed a poorly nourished negress who had some tenderness in the lower abdomen and a palpable tender mass in the posterior fornix of the vagina. At operation both tubes were found enlarged, the right tube being twice as large as the left. Attached to the enlarged thickened left tube there was a large rounded cyst of the ovary. There were no tubercles on the peritoneum generally, as in the preceding case. The postoperative course was prolonged and stormy and a fistula persisted through the abdominal wound. Three months later a second operation was performed, a pelvic abscess found, and drained through the vagina. There was rapid improvement following this operation, and the patient was discharged several weeks later apparently entirely well.

The tubes in this case appear quite different from those in the first one. The right tube is matted down with the ovary into a flat oval mass measuring 8 by 7 by 5 cm. The tube is thickened and spreads over the ovarian cyst which has a thin wall with clear watery contents. This cyst measures 5 cm. in diameter. Over its surface, especially near the fimbriated end of the tube, there are a few small nodules suggesting tubercles. These could easily be overlooked in the operating-room. The inner wall of the cyst is smooth. The tube is rather roughened on the outer surface; it shows some adhesions, but shows no very definite tubercles except about the fimbriated end, where there are nodules suggestive of tubercles. The fimbriated end is closed. The lumen of the tube contains a considerable amount of thick yellowish-green pus. The wall of the tube is markedly thickened and its inner surface is rough, ragged, granular and caseous, with a pale yellowish color. The other tube presents a similar picture.

The microscopic examination of both tubes shows numerous miliary and caseous tubercles particularly abundant in the mucosa. Occasional ones may be found in the serosa, very few if any in the muscularis. Giant-cells are numerous. The epithelial folds are swollen and there is considerable irregular proliferation of the epithelium.

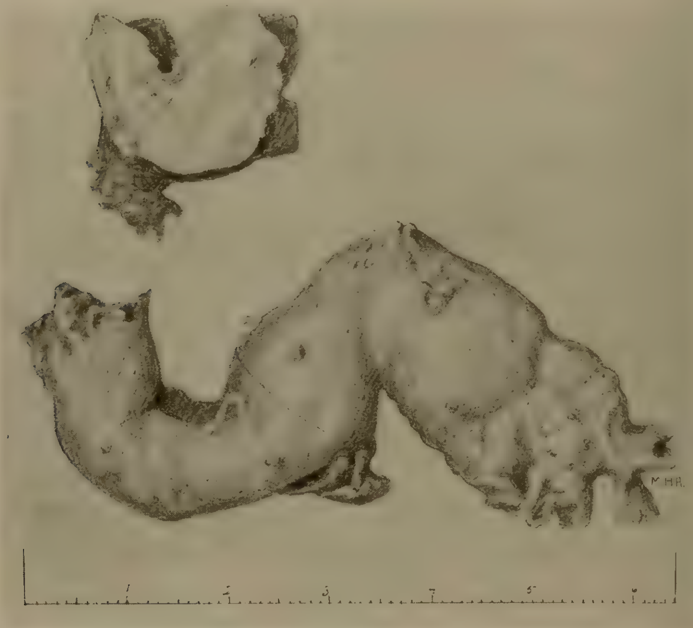

Fig. 741.—Tube from Case II. Also shows a cross-section through the tube at the dotted line.

It will be noted that in this case there was a large cyst of the ovary. A cystic change in the ovary is frequently reported in the association with tuberculous salpingitis. Whether there is a definite etiologic relation between these two is, however, doubtful. It is not often that tuberculosis of the ovary follows tuberculosis of the tube. It is also worth noting that the salpingitis in this case is bilateral. This is true in most all cases of tuberculosis of the tube. Usually the right side is affected more markedly than the left. The tubercles are frequently easily overlooked, so that the condition often comes to the pathologist without a diagnosis being made. This was the case in this particular instance, the microscopic examination first giving a definite clue of a tuberculous process. It is at times impossible to distinguish macroscopically between a tuberculous and a nonspecific pyosalpinx. The finding of tubercles explains the prolonged postoperative course in this case, for such complications are much more frequent with tuberculosis than other infections of the tubes.

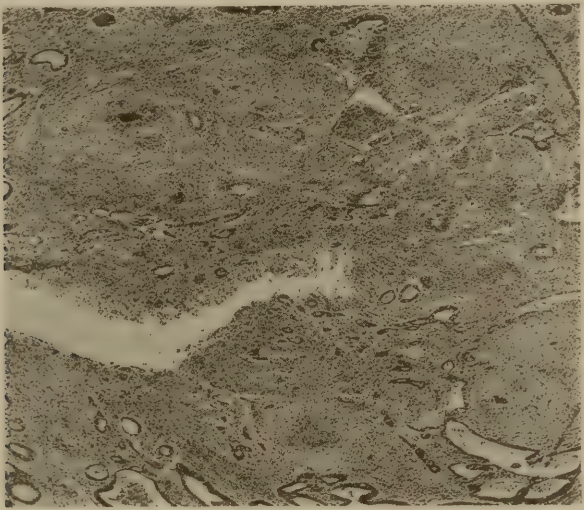

Fig. 742.—Tuberculous endosalpingitis. Low-power magnification of miliary tubercles in mucosa of tube of Case II.

Case III.—White woman, aged forty-one, complained of attacks of pain in the stomach. The first attack was noticed two years ago, the second, one year ago, and the last one began one week ago, beginning just before the menstrual period. These attacks were severe, lasting one to two hours, and were associated with nausea and vomiting. The pain was most marked over the appendix and radiated into the back and pelvis. A tender lower abdomen was felt and tender masses on each side of the cervix. The patient has been married fourteen years, but has never been pregnant. One sister died of tuberculosis. At operation the uterus was found to be retroflexed and held down by adhesions. Both tubes were thickened and inflamed and the left ovary was cystic and matted down behind the uterus. The tubes were twice the normal size and were excised.

These tubes, taken from this case, at first sight did not look as if they were tuberculous. Their surfaces are rough, and on careful inspection occasional small tubercles may be recognized, particularly about the fimbriated end. There are many hemorrhagic adhesions. There is little pus in the lumen. The fimbriated ends of both tubes appear normal and are open. The wall of the tube becomes thickened about 1 cm. from the fimbriated end. As in other cases, the epithelial folds are obliterated and the inner surface shows caseous nodules some of which extend well into the middle layer of the wall of the tube.

The microscopic examination shows many typical miliary and caseous tubercles throughout the wall of the tube. They are also abundant in the muscularis; in fact, some of the largest and apparently oldest lesions are in the muscularis. According to some authors, Kafka in particular, the involvement of the muscularis is significant of the mode of infection. When the organisms reach the tube by way of the blood-stream the muscularis is the first to be involved, whereas, if the infection is derived from the peritoneum, the mucosa is more the primary seat of the lesion.

Another evidence of a hematogenous infection is the fact that the fimbriated end shows so little involvement with the tubercular reaction most marked in the middle part of the tube. Such a hematogenous infection implies the presence of a tubercular focus elsewhere in the body which delivered the bacilli into the blood-stream. These bacilli, finding the tubal tissue a suitable medium for their growth, settled there and began the lesion described. No such primary lesion was discovered in the patient, but a negative clinical finding is not conclusive. Such primary foci may be bronchial glands or pulmonary lesions too small to be detected, or they may have regressed, while the secondary growth in the tubes continued to develop. There has been much controversy on the frequency of the hematogenous mode of infection of the tubes, but the weight of opinion tends to ascribe to it a most important rôle.

This patient made an uneventful recovery after the operation. As in Case II, tuberculosis was not suspected until the microscopic report was obtained. It is worth noting that while the symptoms were more severe and acute, the tubes were not as abnormal or as markedly pathologic as in the preceding cases.

Case IV.—This patient, a colored woman aged twenty-eight, first entered the hospital one year ago, following an attack of abdominal cramps that began suddenly three weeks before. This attack was associated with fever, vomiting, general weakness, diarrhea, and distention of the abdomen. It was so severe for the first two weeks that she had to remain in bed. She was much better the last week before entering the hospital and was able to get up and do some of her housework. She is married, but has never been pregnant. On physical examination some râles were heard over the chest and an indefinite mass was felt in the lower abdomen. Vaginal examination showed a marked tenderness of the pelvic organs. There was slight anemia and a white blood-count of 11,300. The preoperative diagnosis was a partial intestinal obstruction and a sloughing fibroid.

Laparotomy showed a large fibroid in the pelvis bound down by inflammatory adhesions. The small intestines were distended. On separating some of the pelvic adhesions, abscesses were broken into. The patient's condition became very weak, a vaginal drain was placed, and the abdominal wound hastily closed. After the operation the patient had marked elevation of temperature and appeared very ill for several days. A profuse purulent discharge passed out through the vaginal drain, followed by gradual improvement. One month after operation she was discharged still feeling tender in the pelvis, but otherwise much better.

Two months later the patient returned with pain in the right lower quadrant and with an uncomfortable sense of weight in the pelvis. Each morning there were abdominal cramps and pains, with a feeling of weakness and a tendency to faint on standing. The menses were scanty. At the second physical examination she seemed well nourished, though she looked ill. Her laparotomy wound had healed up completely. There was marked

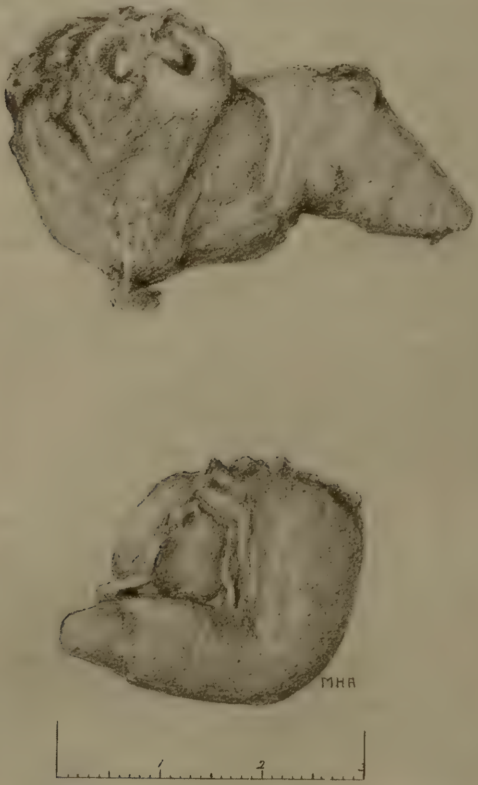

Fig. 743.—Tubes from Case IV.

tenderness in both inguinal regions, particularly on the right side. In the latter region there was some rigidity and a mass about the size of a grape-fruit. Vaginal examination showed indefinite tender masses in both fornices, adherent to the uterus.

The second laparotomy showed a large fibroid protruding from the pelvis and adherent to the intestines in two locations. At the site of each of these adhesions there were small abscesses containing thick, pale yellow pus. The fibroid was attached to the uterus by a small pedicle and was removed. Both tubes were enlarged, thickened, and contained considerable thick greenish-yellow pus. The appendix was thickened and attached to the inflammatory pelvic mass. It was removed along with the uterus and the tubes. For several weeks after the operation the temperature remained elevated, often as high as 103° F., but it gradually returned to normal. One month after the operation the patient was discharged apparently well. Recently, five months after the last operation, she wrote saying that she felt fine and had gained 40 pounds in weight since she left the hospital.

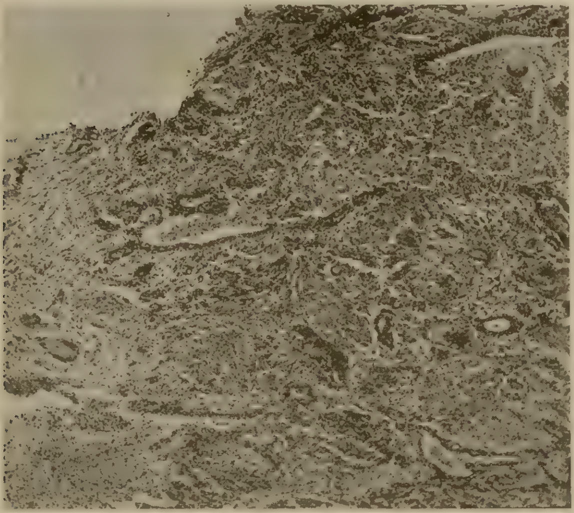

Fig. 744.—Diffuse tuberculous reaction in mucosa of tube of Case IV.

These are the tubes removed from this case. They do not look nearly as bad as was expected from the severe clinical disturbances caused by them. There was no general tuberculous peritonitis. In both you note that the fimbriated ends are open and the walls are thickened. On both there are adhesions on the outer surface, but no definite tubercles. The lumen contains a small amount of yellowish pus, but is partly obliterated by soft friable tissue showing a grayish-white mottling and suggesting granulomatous tissue. The epithelial folds are obliterated. Small caseous foci appear in the inner wall.

The microscopic examination shows many typical miliary and caseous tubercles. In addition, there is considerable diffuse epithelioid reaction in the stroma of the mucosa with scattered giant-cells throughout the tissue between the epithelial masses. Occasional miliary tubercles are also present in the muscularis. There is also a very marked irregular proliferation of the epithelial cells of the folds of the mucosa giving a wild typical epithelial architecture, yet the individual cells do not appear invasive. As in the preceding cases, the lesions are not as marked as was expected from the clinical symptoms, and tuberculosis was not expected until the microscopic examination was made. The prolonged postoperative course was explained by the tuberculous nature of the process.

Case V.—This is a colored woman, aged forty, who came into the hospital complaining of a tumor in the abdomen which she said was first noticed four years ago. There has been some abdominal pain since then, along with difficult and painful micturition. There is marked nycturia. The abdomen has markedly enlarged. Patient has lost 15 pounds in weight in the past year. Her menses have been regular but scanty up to the last time, since which time they have ceased entirely. Patient has been married, but has never been pregnant. One sister died of tuberculosis. On physical examination we found a poorly nourished colored woman whose tonsils were unusually large and a purulent exudate could be seen in the crypts. Palpation of the abdomen showed a tumor mass in the pelvis extending to the umbilicus. It felt hard and smooth and larger on the left side. It did not feel nodular. On vaginal examination the mucosa of the vagina seemed to protrude into the entrance forming a soft mass. Just beneath the symphysis there was an elongated mass that felt indented and seemed to run into the main tumor mass. The cervix could not be felt. The red blood-cell count was 4,000,000 and the white count 7400. The Wassermann test was negative.

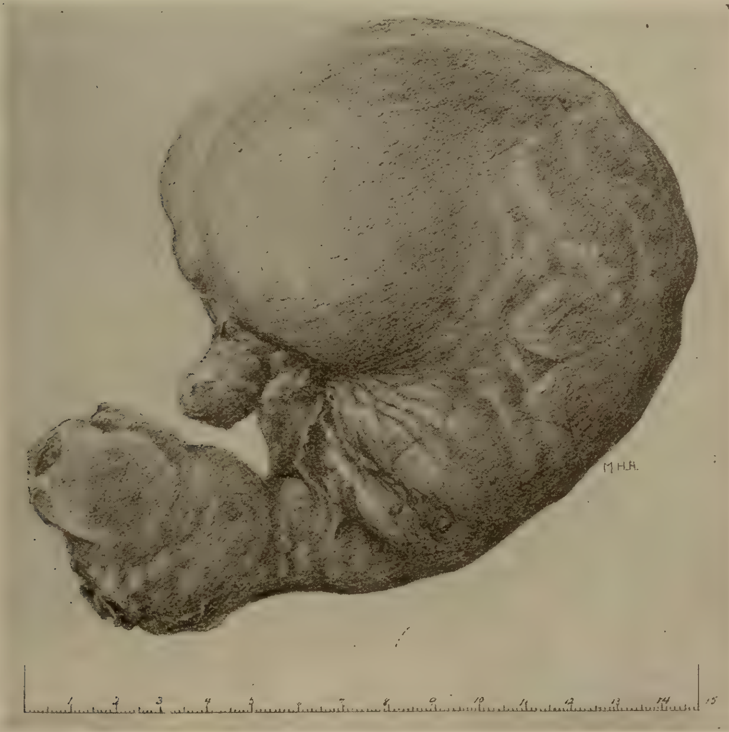

Fig. 745.—Right tube from Case V. Note small sclerotic ovary in the angle of the tubal mass.

At operation a pelvic tumor mass about the size of a cocoanut was found adherent to the peritoneum, intestines, bladder, and lower anterior abdominal wall. This was a large opaque, tough, fluctuating tumor mass arising apparently in the region of the right ovary. In separating this mass from its adhesions its wall was slightly ruptured and a mass of very thick, gelatinous, yellowish-white pus oozed out. This mass was attached by a short narrow pedicle to the uterus. The ovary was small and sclerotic and embedded in a small groove in an angle of the enlarged tumor mass or tube. Underneath this tumor mass there was another smaller elongated coiled mass about as thick as a banana and passing into a cystic swelling about the size of a lemon. The uterus was also distorted and enlarged due to the presence of multiple fibroids. The large mass was regarded in the operating-room as a tubo-ovarian abscess.

These specimens removed in the operating-room are, as you note, very unusual. This very large firm white pear-shaped mass measuring 13 cm. in diameter represents one enormously enlarged pyosalpinx situated on the right side. You will note the smooth outer surface and its mottled grayish-white color. It feels very tense, as if filled with fluid. The wall seems to be very thick. Note this end, which tapers into a small thickened tubal wall measuring 2 cm. in diameter. It is very evident that the large round cystic part represents the large thickened, obliterated, fimbriated end of the tube. Note the small sclerotic ovary in the angle of the bend of this distorted tubal mass. On section we find that the wall is very thick, measuring 3 to 5 mm. in thickness and its cavity filled with a very thick, viscid, greenish-yellow pus. The peripheral part seems more jelly-like in consistency, so that when opened only the inner portion flows out, giving the entire inner surface the appearance and size of a half-section of a cantaloupe. Toward the constricted portion of the tube we note that the inner portion is extremely soft, friable, and spongy in appearance, there being a rather cellular mass protruding from the denser fibrous outer wall. This cellular tissue is profuse toward the uterine end, but flattens out gradually over the wall of the cystic portion.

The other tube is very much smaller, and yet is very much thickened, measuring 3 cm. in diameter. Its fimbriated end is rounded and obliterated. Its outer surface is smooth and the wall is very thick. The lumen contains considerable thick greenish-yellow pus. Its inner wall is very rough, ragged and friable, and seems to contain some encephaloid cellular tissue, other places caseous-like tissue. In the bend of this tube there is a small thin-walled cyst somewhat pear-shaped, containing clear watery fluid. It measures 3 cm. in diameter and 4 cm. in length.

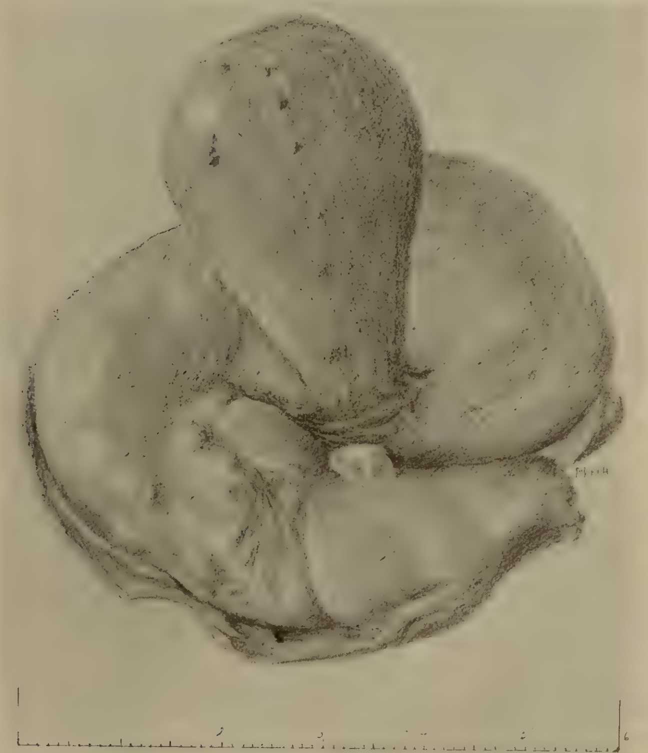

Fig. 746.—Left tube from Case V. Shows thin-walled cyst with tubercles on its surface.

It is attached to the outer surface of the angle of the tube. On the inner surface of this cyst there are many small scattered grayish nodules somewhat suggesting tubercles. These are the only structures in the entire material taken from this patient which suggest the tubercular nature of the lesions.

On microscopic examination typical tubercles are found in

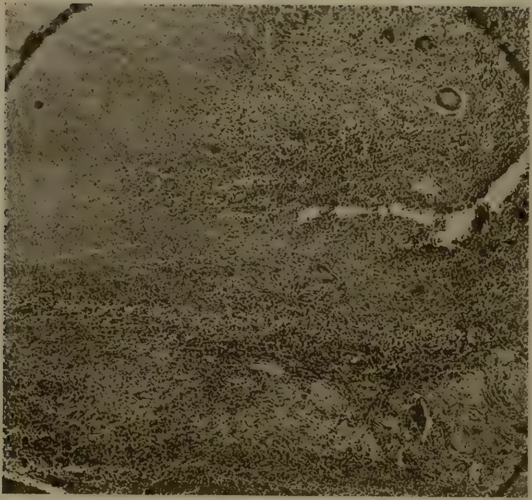

Fig. 747.—Large caseous tubercle in wall of large pyosalpinx in Case V. Note caseation at one side and tuberculous tissue with giant-cells at the other side.

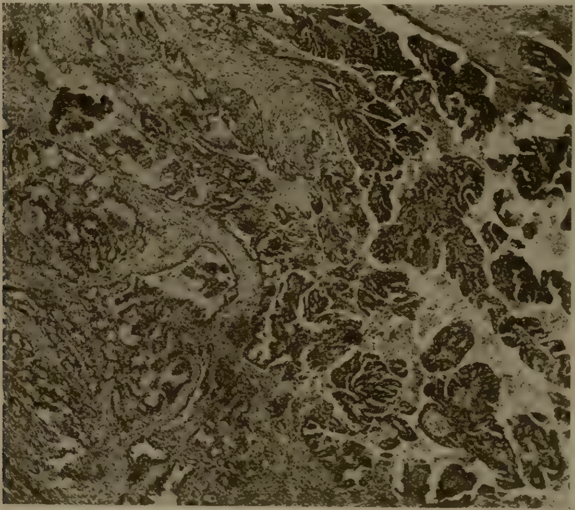

Fig. 748.—Adenomatous reaction in Case V.

almost all parts of the tubes. In the wall of the large cystic mass there are flattened caseous areas. In the proximal end there are scattered multinucleated giant-cells and masses of epithelioid cells with tuberculous lesions being poorly circumscribed. In the larger tube there is also a rather striking change present in the friable tissue noted in the constricted portion of the large specimen. In this region there is a very atypical epithelial hyperplasia, appearing invasive in character and presenting a wild epithelial architecture somewhat resembling a papillary carcinoma. The cells, however, show no mitotic figures. They do not vary much in size and tend to show regressive changes. For this reason, in spite of their apparent invasion into the surrounding fibrous tissue, a diagnosis of malignancy was not made. Even in the stroma of this wildly growing epithelial type of tissue there is tuberculous granulation tissue. The sections of the smaller tube show more typical tuberculous endosalpingitis. Some typical miliary tubercles were seen in the muscle layer, but most of them were in the mucosa. Here also there is a very marked adenomatous formation.

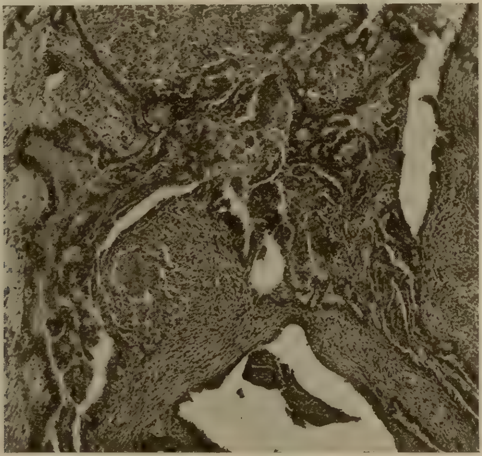

Fig. 749.—Miliary tubercle in the adenomatous area of Case V.

The presence of a myoma in this case, as in the preceding case, illustrates the fact that frequently myomata are combined with tuberculous salpingitis. There is no direct relation between them.

The striking points of interest in this case are the enormous size of the tubes, giving a huge tuberculous pyosalpinx; second, the absence of macroscopic evidences of tuberculosis, and, finally, a pseudocarcinomatous reaction in the epithelium. This might be looked upon as a carcinomatous change in a tuberculous salpingitis. Such changes are reported, but their relation to the tuberculous process is not so clear, especially in this instance. Adenomatous growth associated with tuberculosis of the tubes are common, but true carcinoma is very rare. A number of authors have discussed the relation of carcinoma of the tube to tuberculous salpingitis, and an etiologic relationship is apparently accepted by some, though not as common as the occurrence of simple adenomatous formations. The prognosis in this case is good, as is borne out by the fact that this patient was operated on almost two years ago, and is apparently well today. While carcinoma may occur in connection with the tuberculous salpingitis, it is not very probable that the carcinoma is the direct result of the tuberculous process. The association is probably accidental.

Case VI.—This is a colored girl, aged fifteen, who complained of a hard lump in her stomach first noticed in the lower right abdomen three weeks ago. There has been no pain, though some tenderness on deep pressure, particularly on the right side. Nine months ago the patient had a similar mass, but in the upper left abdomen. She did not feel sick and said that she did not want to go to the hospital, but rather would go on in school. In the past three years this patient has had corneal ulcers and phlyctenular conjunctivitis, for which she had received tuberculin treatments. Her periods were normal and began four years ago. Physical examination showed a colored girl apparently healthy, though her right pupil was more irregular and larger than the left one. The left apex of the lung showed increased breath sounds. A mass about the size of a grape-fruit in the lower abdomen extended to the umbilicus. On vaginal examination there was a mass pushing the fundus of the uterus to the left. The white cell count was 10,000, the red count 4,400,000. An *x*-ray of the chest showed deposits in the hilum with nodes along the bronchi suggesting a tubercular process.

At operation the peritoneal surfaces appeared normal. In the lower abdomen there was a tumor mass about the size of a large grape-fruit attached by a narrow pedicle to the left tube. It was covered with many adhesions. On the right side there was a large pyosalpinx about the size of a lemon. Arising from the left tube there was a large cystic tumor made up of a thin serous wall containing clear serous fluid. This thin-walled sac measured 10 cm. in diameter. The inner surface of this sac was studded with small warty nodules suggesting papillary growths or tubercles. There were many smaller thin-walled serous cysts also arising from the same tube. This tube was enlarged, distorted, and looked like a large pyosalpinx. The ovaries were

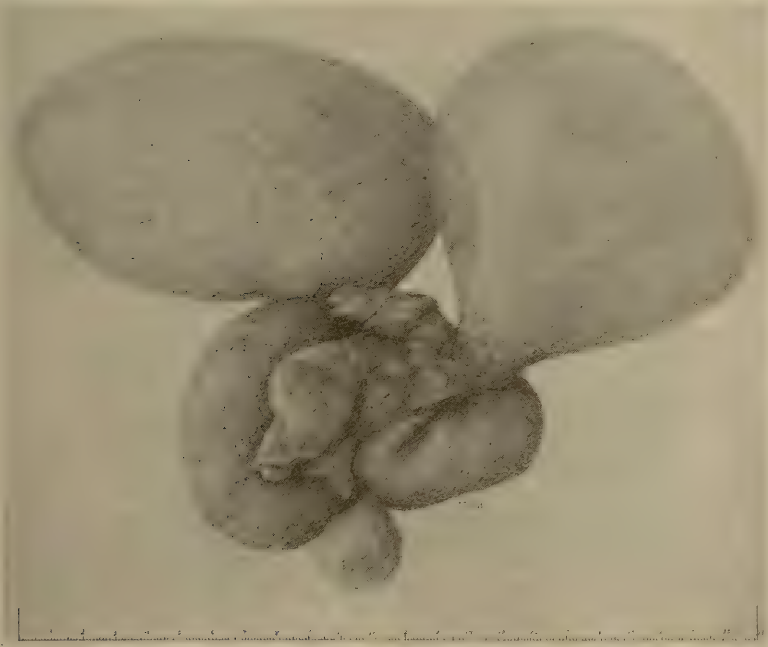

Fig. 750.—Tube with attached cysts from Case VI. The tubercles are only on the inner surface of the cysts.

both enlarged and cystic. Some of the pelvic peritoneum had tubercles suggesting a tuberculous peritonitis.

This is the material removed in the operating-room. Note the cystic nature of the mass. At first it is difficult to determine the relationship of these cysts. First you notice a large oval cyst 12 by 8 cm. attached by a narrow pedicle to this markedly thickened tube. It has a bluish discoloration. It feels boggy. Its wall is thick, and on opening you see the reddish-brown, friable, spongy contents which represent masses of fibrin and remnants of a blood-clot. The inner portion of the cyst is mostly semifluid in consistency and somewhat chocolate in color. Here and there the wall showed small, flattened nodules. Microscopically a few flattened caseous foci were in the wall, otherwise it was composed of hyaline fibrous tissue.

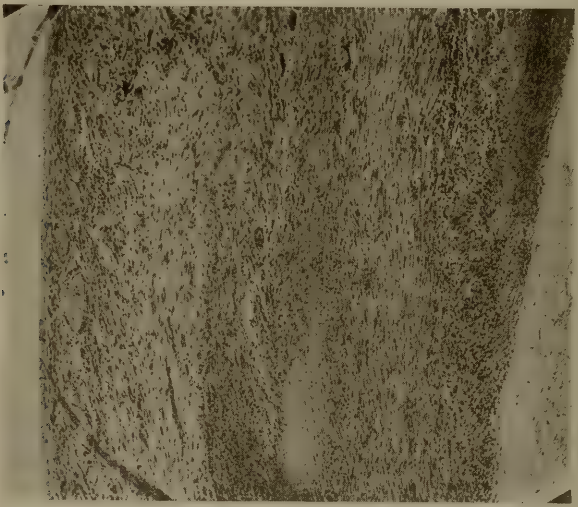

Fig. 751.—Section through the wall of the large oval cyst shown in Fig. 750 (Case VI).

Then you also note another large thin-walled cyst attached to the surface of the middle portion of the tube measuring 12 cm. in length and 8 cm. in diameter. It contains a watery fluid. Its inner surface is covered with many rather scattered, large, warty elevations. A third cyst arising from the same location measures 6 cm. in diameter. Its surface is covered with hemorrhagic adhesions. It has a thick wall and is filled with a jelly-like substance resembling lemon custard. Several small thin-walled cysts were present and apparently arise from the outer surface of the tube. Many of these cysts showed tubercles on the inner surface. Finally, also note the tortuous and thick wall of the tube itself. It is considerably elongated. It is distended in its distal part, the fimbriated end is occluded, and has a pyriform enlargement measuring 3½ cm. in diameter. The tube is kinked upon itself twice in its course, and it is from the surface at the angles of the curves that the cysts arise. Ovarian tissue was not definitely seen in this region. The other tube is also enlarged and shows a pyosalpinx with the fimbriated end entirely occluded, bulbous in shape, and bent over toward the proximal end. In this bend there is a small oval cystic ovary. The lumen of this tube is filled with thick yellow pus and is lined by a ragged grayish-white granulation tissue which appears thick and friable in places. The epithelial folds are entirely obliterated. Neither tube showed tubercles upon their surface. Both tubes show the

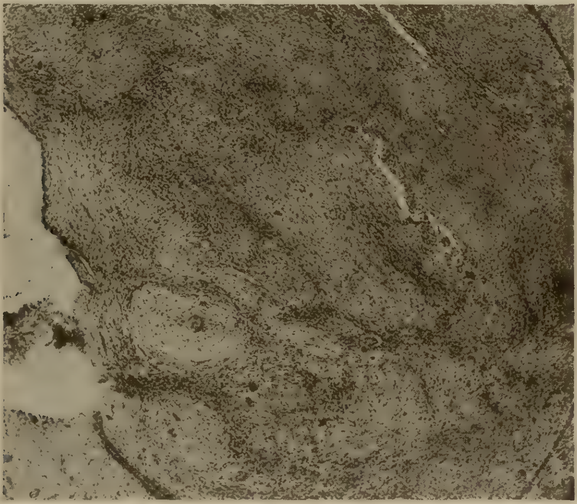

Fig. 752.—Miliary tubercles in mucosa of tube of Case VI.

same picture on the inner surface, both of them containing a considerable amount of pus.

Microscopically, large caseous tubercles were numerous. The warty masses in the wall of the cyst were composed of fibroid and caseous tubercles. Fibrous tissue particularly predominates. In the wall of the tube itself the change was mainly in the mucosa, and in some places a few miliary tubercles were present. The reaction is mostly more diffuse. There seems to be considerable tissue reaction and a rather fibroid character to many of the tubercles. In addition, there was a very marked irregular epithelial proliferation causing adenomatous formations similar to the preceding case, but not as advanced or as irregular. The walls of the thin-walled cyst show nothing but fibrous tissue and no epithelial lining.

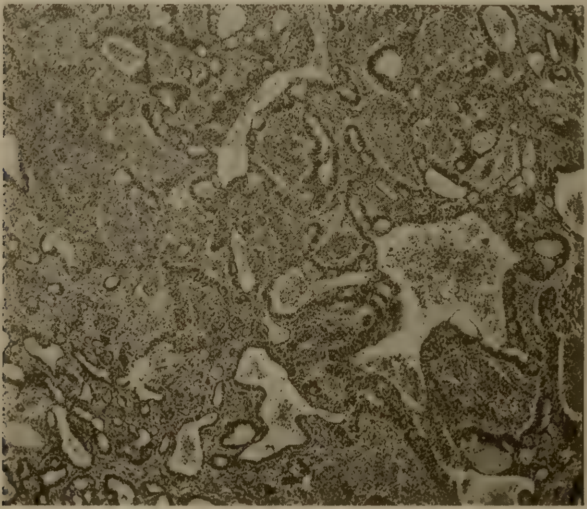

Fig. 753.—Adenomatous reaction in tube of Case VI.

One of the striking points about this particular case is the presence of such marked cystic lesions associated with such mild clinical symptoms. A second point is the peculiar cystic formation arising from the infected tubes. In the third place, the early age at which this infection occurred is unusual, the tuberculous infection occurring commonly much later in life. The cystic formation is to be regarded as secondary to an inflammatory process on the peritoneal surface, the cysts representing nothing but subperitoneal cysts and not lined by any epithelial structure. One of these cysts, however, containing more gelatinous-like material is probably of a different origin and may have been derived from the ovary.

Case VII.—This is a young colored woman, aged twenty-one, who came in the hospital with a complaint that she had a "growing pain" across the lower abdomen. This began three months ago with a severe frontal headache and a profuse thick yellowish vaginal discharge associated with burning on micturition. Three weeks later she became so weak and the backache became so severe that the patient had to go to bed. The backache seemed to radiate up between the shoulders. Two weeks after this there developed a sharp pain alternating with a dull throbing sensation in the left lower abdomen. During the past three weeks the patient has had an uncomfortable sensation in the lower abdomen and also a pushing down sensation with each inspiration. She describes the pain as "if it would tear her open." She lost 30 pounds in weight. Menstruation began at sixteen and was regular up to one year ago, since which time it has been irregular. There was some dysmenorrhea. Following childbirth there is a history of puerperal infection. The patient had been in poor health three months after the birth of the child. One sister of the patient died with tuberculosis. Physical examination showed a poorly nourished, anemic appearing colored woman with a generalized tenderness throughout the abdomen, particularly marked in the lower abdomen and on the left side. Vaginal examination showed marked tenderness on each side of the vaginal fornix with retroflexion of the uterus. There was considerable induration in the broad ligaments on each side. Clinical diagnosis was a bilateral salpingitis with a retroflexed uterus. Blood-count was about 4,000,000 red and 8000 white blood-cells. The temperature went up to 101° F. before the operation, but after the operation went up a little bit higher for several days. While in the hospital the patient complained somewhat of night-sweats.

At operation numerous adhesions were found in the region of the pelvis. Many of these adhesions appear hemorrhagic. Both tubes were markedly enlarged. The uterus was retroflexed with considerable attachment of the intestines through this region. On breaking down some of the adhesions a considerable amount of pus oozed out from one of the tubes. The tubes and uterus were removed with some difficulty. Apparently one of the tubes formed a wall of a pelvic abscess. Culture made from this pus showed a Gram-negative bacillus and also some cocci. There were no tubercles over the peritoneum generally.

This is the specimen which was removed at operation. You will notice the uterus is rather small. The tubes are flattened out, but very much enlarged, markedly inflamed, and covered with numerous hemorrhagic adhesions. On one side the tube is so ragged and irregular that it suggests a part of the wall of a pelvic abscess. About the edges of this ragged inflamed tubal tissue there is a considerable amount of fibrin. The fimbriated ends are open. Over the surface of the tubes, particularly near the fimbriated end, the tissue is roughened and there are small translucent grayish nodules somewhat suggestive of tubercles. The lumen of the tube contains a moderate amount of pus. The epithelial folds are in places obliterated. The wall of the tube is markedly thickened and apparently shows some small caseous nodules throughout its substance. The uterus is small. Histologic examination shows many typical tubercles in the mucosa of the tube. There were many diffuse, poorly defined tubercles. There was also much tuberculous granulation tissue containing many typical giant-cells. The reaction appeared to be much more acute and diffuse than the other cases. Some areas suggest an acute pyogenic infection superimposed on the specific lesions.

This patient shows a much more acute type of tuberculous reaction corresponding with a more severe and acute clinical picture. The finding of other organisms with pus suggests the presence of a pyogenic infection superimposed on the tuberculous process. You will also see in this case a definite tuberculous involvement of the endometrium of the uterus. This is a rather common sequel of a tuberculous salpingitis. It is rare to have a primary uterine process with extension up the tube, and even questioned by some authors.

Case VIII.—This was a young colored woman, aged twenty-three, who came into the hospital complaining of pain in the right lower quadrant beginning six weeks ago. At first she was able to be up, but could not attend to her housework. After four weeks she had to go to bed. There has been considerable headache. The pain is often sharp and throbbing in type; at other times it had a more dull, aching character and radiated to the lumbosacral region. There was some vomiting, nausea, fever, and occasional night-sweats. Patient has been married. She has had an acute leukorrheal discharge beginning one year ago. She has had one child, aged six years. The menses have been irregular and entirely absent in the last five months. Physical examination showed a tender abdomen somewhat more marked in the left lower quadrant than on the right. Bimanual examination showed a tender mass situated in the midline between the symphysis pubis and the umbilicus. Inguinal glands were enlarged. There were some casts and albumin in the urine.

At operation the omentum was found firmly adherent to the tubes. There were marked adhesions about both tubes and the uterus, the tubes being considerably thickened and indurated. The uterus was also enlarged. The tubes were enlarged and contained pus.

Following the operation the patient complained of considerable abdominal pain. There was considerable elevation of the temperature, at times running up as high as 101° F., and marked epigastric discomfort and tenderness. Three weeks after the operation the patient was discharged, but returned the following day complaining of marked pain in the epigastrium. Physical examination showed nothing to account for this pain, which seemed to be more severe in the pit of the stomach and did not involve the pelvic region. In spite of continuous treatment there was no improvement and the patient was again discharged.

During her second admission temperature was elevated to 101° F. on several occasions. These specimens were taken out at the operating-room and do not show very marked changes. However, you will notice that the tubes are enlarged, indurated, and the wall contains encephaloid tissue. The lumen contains some caseous material and the folds are obliterated. A section through the wall shows a considerable number of irregular yellowish areas suggesting caseation or softening. On opening the uterus, which is also enlarged, the mucosa seemed to be roughened and friable and more granular than is usual. No definite tubercles, however, could be seen on the surface of the tube.

Histologic examination through the uterus showed considerable disintegration of the endometrium, and here and there a few small scattered tubercles showing typical giant-cells. Several areas of caseation necrosis were found. Tubercles could be seen scattered throughout the muscle layer of the uterus. In the wall of the tube typical caseous and miliary tubercles were present, but the more striking change was the extensive caseation which involved the interior of the tube; in fact, most of the lumen of the tube is lined by caseous granulation tissue behind which a few smaller caseous tubercles could be seen. Some of these tubercles also extended into the muscularis and occasional ones were found in the serosa.

This particular case shows nothing very unusual or worthy of special mention. The fimbriated end, however, in this case was wide open. The tubes grossly did not look very abnormal, yet microscopically very marked changes were found and a rather extensive active tuberculosis present. Another feature worth mentioning is the fact that the entire uterine wall was infiltrated with tubercles as well as the endometrium. The severe clinical symptoms which this patient had could be explained to a certain extent by the extensive active tuberculosis present in the organs. Another point worthy of notice is that here we have tubes again which grossly did not strongly suggest tuberculosis.

Case IX.—This was a colored woman, aged twenty-eight, who came into the hospital complaining of amenorrhea, not having had any periods for one year. Occasionally she has had pain in the back and along the left side. The abdomen has become enlarged in the last ten months. She has shown an increase of weight of 40 pounds in the past year. She has never been pregnant, though she has been married several years. Puberty began at sixteen. The menses have always been scanty. On physical examination the abdomen was found to be very large and an indefinite mass could be palpated in both flanks. On the right side there was some tenderness on deep pressure, particularly in the lower quadrant. Apparently there was also some fluctuation. The legs were large and edematous. Vaginal examination showed retroflexion of the uterus and a rather large soft mass over the fundus. At operation the uterus was found to be infantile. The tubes were enlarged, infected, and bound down with adhesions. There was a small abscess in the right cornua of the uterus which measured about $1\frac{1}{2}$ cm. in diameter. On opening this abscess it seemed to be lined by yellowish granulation tissue and contained yellowish thick pus. Following the operation there was an elevation of temperature to 101° F. on the fourth day, otherwise the postoperative course was uneventful and the patient apparently made a complete recovery.

These tubes appear to show very little change. They are thicker than usual, but about the same size. The outer surface is covered with few adhesions. The lumen does not show anything very marked except near the proximal end, which is very much thickened and contains an abscess as noted at operation. One of the tubes shows several hard nodules 3 to 4 mm. in diameter. On section through these indurated nodular portions we find that the center is made up of considerable caseous-like material suggesting an old abscess. Microscopic examination through these nodules shows them to contain caseous material surrounded by epithelioid tissue within which typical multinucleated giant-cells are found. In the surrounding tissue there is considerable fibrous tissue and also some irregular calcified foci or deposits. Only a few definite tubercles were present, in most places there being considerable fibrosis.

This is evidently a case of tuberculous salpingitis, in which the lesion is partly healed. Its location so close to the uterus, while the rest of the tube shows no tuberculous change, suggests possibly this may represent extension of a uterine tuberculosis up into the tube. This is not likely, however. The uterus was not removed.

Case X.—This is also a colored woman, aged twenty-seven, whose main complaint was pain and a constant ache in both lower quadrants, but particularly marked on the right side. It began two months ago with marked leukorrhea and an irritating vaginal discharge. There has been some vomiting and also some chills and fever. Symptoms seemed to be worse during menstruation. The patient is married and has one child living and well. In the last six or seven months the periods have been very irregular.

On physical examination the abdomen was found to be very tender in the lower portion and a tender mass could be felt above the symphysis. Vaginal examination showed a hard tender mass near the fundus of the uterus and another mass in the culdesac. At operation numerous pelvic adhesions were present about the uterus and the tubes. Both the right tube and ovary were involved in a large pelvic abscess. This also involved a portion of the intestines. The left tube and ovary were also bound down in adhesions including a cyst which was ruptured in attempting to remove the tube and uterus.

The postoperative course was uneventful, though there was some vomiting following the operation and a moderate amount of pain in the right side. There was also some drainage from the incision. On the ninth or tenth day after the operation there was an elevation of temperature to 100° to 101° F., but this gradually returned to normal. For several days the patient complained of dizziness and drowsiness. Three weeks after the operation the patient was discharged apparently well.

This mass of material covered with adhesions consists of the uterus and two enlarged tubes. The uterus itself is also enlarged and covered with adhesions. Its wall is thickened. You will notice as we open the lumen that the mucosa is different than is usual. Instead of having a smooth velvety appearance it has a yellowish-gray, roughened, granular appearance. It seems to be definitely indurated. Apparently there are also some small translucent grayish nodules which somewhat suggest tubercles along its surface. Both tubes are considerably thickened and enlarged. The wall is markedly thickened. The lumen of the tube is not very markedly distended, particularly the smaller tube, in which the lumen is filled by an encephaloid type of tissue. The other and larger tube shows obliteration of its distal end. The wall of this tube is thickened, and in the lumen there is a small amount of yellowish caseous material. This tube is flattened out over a large ovarian cyst.

Microscopic examination shows many typical tubercles in the uterus. In the tube the most striking change is marked hyperplasia and overgrowth of the epithelial structures and epithelial folds, in many places somewhat suggesting an adenomatous papilliferous type of growth. The stroma of these epithelial folds is abundant and shows a tendency to be replaced by masses of epithelioid-like cells. In some places there is a tendency to caseation. In other places there are large accumulations of pus-cells. No very definite typical circumscribed tubercles could be seen. However, the epithelioid reaction, the marked hyperplastic reaction, and the caseation associated with definite tubercles that are present in the uterus form the basis for a probable diagnosis of tuberculous salpingitis.

Tuberculous salpingitis is a frequent pathologic lesion in the tubes. Up to Hegar's monograph in 1886 it was regarded as a rare condition, and even up to 1909 it was so uncommon that individual reports of cases were frequent in the literature. Greenberg found that nearly 1 per cent. of all gynecologic cases had tuberculosis of the tubes, and that of every 13 abnormal tubes removed, 1 was tuberculous. Statistics regarding the frequency of tuberculous salpingitis vary a great deal. This is in part due to the fact that microscopic examination is not always made, and without a microscopic examination diagnosis is often impossible. Williams showed that 75 per cent. of his cases of tuberculous salpingitis were not recognized by macroscopic examination. Several authors have recently emphasized the same necessity of a microscopic examination before tuberculous salpingitis can be excluded. There is no question but what a low-grade non-specific inflammation is impossible to distinguish from a tuberculous salpingitis. Out of 216 pathologic tubes removed in this clinic in the past four years, 11 were found to be definitely tuberculous, and only 3 of these were definitely recognized at operation. Out of these 11 cases only 1 was suspected clinically.

Tuberculosis is much more frequent among the colored women than white women. In our series all but 2 of the cases were in colored women. Tuberculous salpingitis occurs during the period of greatest sexual activity of the woman, that is, especially between the ages of twenty and forty. However, we had one patient who had the disease at the age of fifteen. Occasionally tuberculous salpingitis does occur in young girls. The frequency of tuberculous salpingitis with active sexual life may bear some direct relation with the alternate congestion and anemia of the tube occurring with each period. Congenital maldevelopment of the internal genitalia seems to predispose to tubal tuberculosis. Merletti found 28 cases of tuberculosis of the uterus out of 80 cases of hypoplasia. A family history of tuberculosis is present in a large proportion of the cases. Greenfield reports 22 per cent. with a positive family history. Three out of our 11 cases also showed a history of either brother or sister having died of tuberculosis. A large number of the cases, in fact, most of our cases (that is, 6 out of the 11) gave a history of sterility. This frequency of sterility is noted by other authors. Whether sterility is due to the tuberculosis, or a sterile condition predisposes to tuberculosis is a question that we are not prepared to answer. It is improbable, however, that there is a definite connection between the two. The onset of the disease is said to be associated in a large number of cases with some phase of uterine activity, such as an abortion, childbirth, or the onset of menstruation.

The relation of tuberculous salpingitis to tuberculosis in other portions of the body is a question that has excited a great deal of discussion without any very definite conclusion. Antecedent history of tuberculosis, such as an old pulmonary lesion, pleurisy, or bronchitis, is often present. In only 1 of our cases (No. 6) was there a definite antecedent history, the patient having been treated for phlyctenular conjunctivitis. An *x*-ray was made from the lungs of this patient, and evidence of tubercular involvement of the lungs were found. In none of the other cases was evidence of tuberculosis in other portions of the body found. The two points which have aroused a great deal of controversy are, first, whether tuberculosis in the tube is primary or not. It is generally held that while primary tuberculosis may occur, it is extremely uncommon. The other question, the relation to tuberculosis of the peritoneum, brings up a very much disputed question as to the mode of infection of the tube. It was thought at one time that most of the tuberculous infections of the tube were due to an ascending infection extending up from the lower genital tract, a theory supported by Cohnheim. The weight of opinion at the present time is that while such an ascending infection may occur, it is extremely uncommon. The two most common modes of infection are either by way of the blood-stream or by an extension from a process situated in the peritoneum. It is probable that the latter is more frequent than the former, but here again there is a great deal of difference of opinion among different authors. In the hematogenous mode of infection the course implies that there is a primary focus somewhere else in the body from which tubercle bacilli have escaped into the general blood-stream. The objection to this theory is that in many cases of tuberculous salpingitis no definite primary focus can be found; however, it is well to bear in mind the fact that failure to demonstrate a primary focus does not exclude the existence of such a focus, inasmuch as it may be too small to produce physical signs, while, again, it may have disappeared by the time the secondary process in the tube has developed to the stage where it has resulted in operative interference and its recognition.

There is no question but what a tuberculous salpingitis may lead to an infection of the peritoneum. On the other hand, it is much more likely that infection occurs more frequently in the other direction, that is, from the peritoneum to the tubes. Weigert has shown that when large numbers are introduced into the peritoneal cavity a general tuberculous peritonitis occurs, and when small numbers of bacteria appear in the peritoneum they produce a localized peritonitis about the pelvic peritoneum. It has also been shown that foreign particles which are introduced into the peritoneal cavity tend to gravitate into the recto-uterine pouch, and from this they may be aspirated up into the tubes. This aspiration is brought about by the action of the cilia and the muscular movement of the tube in the same way as the ova are drawn into the tube. It is held by many that this is the means by which tubercle bacilli escaping into the peritoneal cavity may get into the tube without producing a definite peritoneal tuberculosis, and these organisms, finding in the tubal mucosa a point of lowered resistance, developed the lesion in the mucosa or submucosa. The only method by which constant success in experimental tuberculous salpingitis is obtained is the injection of tuberculous material directly into the tube of the guinea-pig. Other methods have always given inconsistent and inconstant results.

Tuberculous salpingitis is usually bilateral, being present in both tubes in all of our cases, though it may be unilateral. It usually occurs more frequently on the right side than on the left. Furthermore, the tubes are more frequently the seat of tuberculosis than any other portion of the female genitalia, the uterus and then the ovary being involved in this order of frequency. The ovary, as just noted, is more rarely involved; however, it does occur occasionally. The relation of tuberculosis of the tube to that of the ovary in the female bears essentially the same relation as that of the epididymitis in the male to tuberculosis of the testicle. However, while in men tuberculosis of the kidney and genito-urinary tract is commonly associated with tuberculosis of the genital organs, such association is very rare in woman.

In a certain group of cases tuberculous salpingitis resembles nothing but a chronic thickened tube such as any other chronic salpingitis does, and cannot be distinguished from a chronic pyogenic infection. In a second group of cases tuberculous salpingitis resembles an ordinary chronic pyosalpinx. The tube is enlarged. The distal end is occluded. It often has a general sausage shape. The lumen of the tube is filled with thick greenish-yellow pus and the inner wall shows a caseous area and cellular friable granulomatous tissue. In fact, the inner wall may have an encephaloid appearance. In most cases typical tubercles are not present, or, if present, they are about the fimbriated end only. The fimbriated end may be open, though Williams reports closure in 50 per cent. of his cases. In the third group of cases the serosa may be covered with numerous tubercles. This type is more frequent in cases where there is a general tuberculous peritonitis with a secondary extension over to the tubes. The most common gross form which is noted in our cases is the pyosalpinx. Occasionally cystic formations may be present and often become very complex. Apparently they arise from a fusion of the various adhesions present over the surfaces of the tube, and represent nothing but secondary tuberculous inflammatory reactions, such as were noted in Case VI. There is another type of reaction which is quite striking in a number of our cases, and is mentioned by a number of other authors, and that is the neoplastic type of tuberculous reaction. That is, the type in which there is a marked epithelial hyperplasia, so marked as to lead to the formation of adenomatous structures protruding into the lumen of the tube. Some of these structures are so irregular and appear so invasive as to suggest a malignant change. In fact, some authors speak of these as precancerous lesions; however, the association between this condition and a cancer has not been definitely established and is probably accidental rather than etiologic.

In all of our cases the diagnosis was based upon specific histologic changes. No stain for tubercle bacilli were made. As a general rule the histologic diagnosis is very simple. Usually there are well-circumscribed caseous tubercles, especially in the mucosa. There is usually an endosalpingitis, perisalpingitis, occurring in a certain group of cases. The muscularis is relatively rarely affected. In some cases the reaction is much more diffuse, typical giant-cells being embedded in an epithelioid transformation of the stroma. In other cases the caseation is much more prominent, while the entire inner surface of the tube may be lined by caseous material supported by tuberculous granulation tissue. Occasionally there is a more chronic type of granulation tissue containing giant-cells with a considerable amount of fibrous tissue. Many of the tubercles may be fibrous in type. All of these forms may be present in a single tube at the same time. Usually one form predominates. The caseous and the miliary types are both common, and the mucosa is the main seat of the change. In fact, in most cases there is an "endosalpingitis pseudofollicularis tuberculosa" as it is called by some German authors. Frequently there is a very marked epithelial hyperplasia, irregular edematous folds, and numerous crevice-like spaces lined by epithelial cells. .The epithelial cells are often very irregular, the nuclei show numerous atypical forms, but the general appearance does not suggest a malignant change. In fact, most of the cells tend to show regressive rather than proliferative changes. In some cases the larger and older tubercles are seen primarily in the muscularis, suggesting a hematogenous infection. Kafka regards this as a distinguishing point between a hematogenous and peritoneal infection; in the latter the involvement being mainly in the mucosa and submucosa, in the former, in the muscularis.

Certain lesions are quite commonly associated with tuberculous salpingitis and are worthy of mention. Occasionally there is an acute appendicitis, especially a periappendical reaction. Adenomyomata are also fairly frequent. In these cases there has been considerable discussion as to whether the glandular growth is secondary to tuberculosis or whether the adenoma was primary and predisposed to a tuberculous infection. The former seems more likely. Again, myomata are rather frequently found, being noted in 20 per cent. of the cases in one group of statistics. They are present in 3 of our cases. Cystic ovaries are very commonly reported, but it is doubtful whether there is any definite connection between the two. Carcinoma is also reported in the association with tuberculous salpingitis, but a true malignant change is probably very rare, and when it does occur it is very doubtful if it bears a definite relationship with the tuberculous salpingitis. Tuberculosis itself produces such a markedly atypical adenomatous change that a diagnosis of malignancy should be made with considerable reservation. It should be regarded as an inflammatory hyperplasia. Pelvic abscesses are also frequently reported in connection with tuberculous salpingitis. These abscesses frequently lead to fistula formation, and healing is often delayed and troublesome. The postoperative results are often relatively stormy and may result in abdominal fistula.

The symptoms are often very obscure. There is usually abdominal pain and tenderness, especially in the lower part, but it is not severe. In fact, it may be absent and only a sensation of weight in the pelvis obtained. Some of the patients come in complaining only of a mass in the abdomen, some loss of weight, and occasionally some elevation of the temperature. Occasionally night-sweats and chills are complained of. As a general rule severe constitutional symptoms do not occur unless there is an associated general peritonitis. There is usually a tender palpable mass in the vaginal fornix. Amenorrhea is reported in a certain number of cases and other menstrual disturbances are sometimes reported. Sterility is frequent in married patients. Often there is an obscure abdominal pain for months, with pains radiating into the lower back. Leukorrheal discharge is usually present. Physical examination of the chest and other portions of the body usually fails to reveal a primary focus for the tuberculous lesions.

A prognosis after removal of the tubes is good as long as the tuberculous process is limited to the pelvic adnexa, but it becomes grave when there is active tuberculosis elsewhere, when there is a pre-operative elevation of temperature, and when there is extensive involvement of the peritoneum.

Perhaps the most striking characteristic of tuberculous salpingitis is the absence of distinctive and characteristic clinical symptoms, simulating a low-grade infection and often showing relatively slight destructive lesions. Abundant adhesions are commonly found. This lack of striking characteristics accounts for the frequency with which a clinical diagnosis is not made.

Only 13 per cent. of the cases at Johns Hopkins Hospital were diagnosed clinically according to the recent report of Greenberg. Furthermore, the mere gross inspection of the tube fails to reveal the true nature of the disease in most cases. As a general rule where there are markedly active histologic changes and rapidly growing tissue the clinical symptoms are much more severe than in those cases where there is more marked fibrosis histologically, at least this is the impression obtained from the study of the cases in our list. It is, however, rather hazardous to attempt to correlate the severity of clinical symptoms with the extent of histologic or gross anatomic changes in a given case. Occasionally a severe clinical case may show relatively slight changes in the tube, though this is not the rule.

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CLINIC OF DR. MERVIN T. SUDLER

The Bell Memorial Hospital

PAROTITIS FOLLOWING ACUTE SUPPURATIVE APPENDICITIS

Patient is a young woman thirty-one years old, who was seized with an acute attack of appendicitis thirty-six hours before operation. Her pulse had risen to 96, the leukocyte count was 20,000, of which 88 per cent. were polymorphonuclear forms. The temperature was 101° F.

Under gas-oxygen anesthesia the abdomen was opened by a transverse McBurney incision. The appendix was found adherent and retrocelic. The base of the appendix was freed, ligated, and buried with a Gould stitch. In separating the appendix an abscess was opened which contained about 10 c.c. of pus. The portion of the appendix which had not sloughed was removed, drainage inserted, and the incision closed. In thirty-six hours the abdominal symptoms were satisfactory, but the right parotid region became sore and tender and the patient's temperature rapidly rose to 104.4° F. (mouth), 105° F. (by rectum). Twelve hours later the left parotid became swollen, though the fever never again reached the height of the initial rise.

The abdominal condition has healed without complications or unusual symptoms. The right parotid returned to normal in eight days. The left has remained hard and more or less painful for fourteen days. The pain was aggravated while lying down and was partially relieved by a sitting posture. The patient also complained of some pain in the ears, and for the first week the patient expectorated a sticky purulent material which decreased rapidly and completely disappeared a week before the swelling subsided.

The situation was complicated by the existence of mumps in the adjoining residence. The patient states that she had mumps when seven years old. The question of whether the patient is suffering from epidemic parotitis or the form which supervenes in acute abdominal conditions immediately arose. However, with the history of having had the epidemic form and the fact that she was an adult suggested the diagnosis of acute parotitis following abdominal inflammation.

The occurrence of parotitis following abdominal conditions of various kinds has been reported quite frequently. It occurs with sufficient frequency and with grave enough symptoms to arouse interest. Dyball has given us the most careful study of this condition, which he calls "celiac parotitis." Blair and Padgett have given in a recent article an analysis of 58 cases. It occurs after injuries to the urinary tract, disease or injury of the alimentary canal, disease or injury of the abdominal wall, peritoneal pelvic cellular tissue, and disease and injury of the generative organs. The time of its appearance varies from twenty-four hours to two or more weeks, and a few cases are reported where it developed much later. Both glands are involved in about 30 per cent. of the cases.

The severity of the symptoms varies from a simple enlargement with moderate pain to gangrene and death, in exceptional cases. Dyball had such a case develop on the fourth day following an operation for acute appendicitis. There were no unusual abdominal symptoms. Abscess (practically unknown in mumps) develops in about one-half of the cases.

Four theories have been suggested in explanation of its occurrence:

1. The pyemic.
2. Oral sepsis.
3. Reflex.
4. Toxic.

The pyemic theory explains the condition on the basis of blood-borne infection. The theory of oral sepsis explains it on the basis of transmission of bacteria from the mouth up the ducts to the glands, and there giving rise to inflammation. The reflex theory presupposes some dilation and metabolic changes in the gland due to the irritation of sympathetic nerves in the abdomen. As there are no known facts in normal anatomy or physiology to form a basis of this explanation, it will not be referred to again. Dyball suggests as the possible cause certain toxic substances present in the blood which are derived from (*a*) certain organs modified by injury or disease, or (*b*) microbic origin, or (*c*) deranged digestion, and that in cases where abscesses develop a secondary invasion by organisms either directly from the mouth, up the ducts, or through the blood-stream occurred.

In 1916 Rosenow and Dunlap reported an epidemic of appendicitis and parotitis probably due to streptococci contained in dairy products at the Culver Military Academy. There were 34 cases of parotitis and 8 of appendicitis. However, apparently the two lesions did not develop in the same individual. From four of the appendices streptococci were cultured which gave rise to parotitis and appendicitis in rabbits in varying proportions, showing that these two organs had a very similar affinity for this particular organism. From some samples of butter and cheese organisms having similar specific properties were isolated.

Rosenow's work on the specific action of morphologically similar bacteria has been very ably confirmed by Haden, using his own technic on cultures made from freshly extracted teeth. He believes that the slight variation in the oxygen tension of the various organs is the simple explanation of the selective action by the bacteria. In the cases reported by Rosenow there seems to be a marked susceptibility of the appendix and the parotid to the same strain of streptococci. If it is possible to reproduce various definite lesions of joints, eyes, kidneys, heart, stomach, etc., by bacteria obtained from cultures taken from the teeth or tonsils there is no reason why the same result should not be obtained in cases of infection in the abdominal organs, and from this it would seem that the preponderance of the evidence is in favor of selective bacterial invasion by organisms carried by the blood-stream, just as the weight of evidence is in favor of most infections of the appendix being of hematogenous origin.

The symptoms of the patient before you would seem to be in accordance with this explanation, though unfortunately there was no immediate bacteriologic examination of the appendix. A section from the appendix stained for bacteria shows: Large numbers of single cocci; many pairs and occasional chains of six to eight organisms. These stained positively by the Gram method. The pus obtained from the ducts showed a short chain, non-hemolytic streptococcus. Forsee reports a case with an abscess, the pus from which gave Staphylococcus aureus in pure culture. So apparently the cause is not limited to the streptococci alone.

It is evident if this idea of its cause be correct nothing can be done that will prevent it. Fortunately, it is not a common complication. There is a possible chance of secondary or primary mouth infection, and under any circumstances of health or disease a clean tongue and teeth are of great importance, and under these conditions might serve to decrease the severity of the symptoms.

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CHOLELITHIASIS, CHRONIC CHOLECYSTITIS, AND CHOLANGITIS

The patient is a stout woman forty-nine years old. She has had 11 children, 7 of which are living and well. Her teeth, tonsils, urine, blood, heart, and blood-pressure are negative. Eight months ago she had a supravaginal hysterectomy for fibroids, and a large ventral hernia resulted. She entered the hospital primarily to have this repaired. This was operated upon three weeks ago, and at the time the gall-bladder was palpated in order to obtain accurate information concerning the abdominal symptoms of which she had complained for about fifteen years. The gall-bladder was found free from adhesions, normal in size, and except for the fact that five or six calculi could be palpated, nothing abnormal could be felt. The stomach and other organs were negative. This gave us an opportunity to co-ordinate the symptoms with the pathology for the three weeks intervening between the operation for the hernia and the operation for the removal of the gall-stones.

The symptoms of which she complained are as follows: About fifteen years ago she began to have pain in the upper part of her abdomen, sharp, sticking in character, and these pains came on without any reference to meals. They apparently started in the stomach and then spread to the right side, back, and chest. They would last from one-half to one hour and then disappear. Afterward the right side of the abdomen was quite sore and tender on pressure. Finally any pressure in this region would excite the pain. Active exercise of any kind would cause it also. She was never jaundiced. She was never nauseated unless she drank cold water at her meals, which on several occasions made her vomit. Along with this pain in her stomach she had a great deal of gas in the intestines and belching. As far as she knew no fever accompanied these attacks. She has never had typhoid fever.

The abdomen is opened by a Bevan incision; the gall-bladder and edge of the liver come plainly into view. The condition of the gall-bladder is unchanged from the former examination, though we now have the opportunity of seeing it as well as feeling it. The calculi can be felt as before. The ducts and head of the pancreas are exposed and examined and found negative. In this patient this is relatively easy to do, since there are no adhesions and the exposure is good. Therefore, by standing on the left side and palpating with the right hand, we can make a very accurate examination. On the other hand, where there are adhesions and where the head of the pancreas has been inflamed one can only be sure of the absence of stones by passing a probe into the duodenum and palpating along the probe. The gall-bladder is definitely whitish instead of the normal slaty blue color, showing that in the past considerable inflammation has been present and that the thickening of the gall-bladder has resulted. This change in the translucence of the gall-bladder is characteristic of cholecystitis and is caused by the thickening and increase in the connective-tissue elements of the outer wall; usually leaving the mucosa unchanged. Inasmuch as the mucosa should be the first part involved if the infection came directly from the bile, the location of the pathologic changes supports the idea that the large and intimately connected lymphatic vessels of the liver and gall-bladder furnish the usual route of infection. The edge of the liver also is rounded and somewhat irregular, showing that the inflammation has not been confined to the gall-bladder, but extended to the liver also. While this condition is usually much more pronounced in calculi of the common duct, a careful examination of the liver in most cases of cholecystitis show that a cholangitis has also existed as in this case. Peterman states that this is true in approximately 65 per cent., but this is evidently very much too low. At the time of operation it is recognized by the edge of the liver becoming rounded and blunt, and often irregular instead of thin and even, and evidences of the formation of scar tissue in other portions. The presence of cholangitis also shows itself before operation by the enlargement recognized by Riedel. According to Graham, this begins as a pericholangitis, and this, in turn, leads to the infiltration and increase of connective tissue in the periportal and interlobular spaces. As the gall-bladder is badly damaged and the patient in good condition, we shall remove it. This was done from above downward. The cystic duct was doubly ligated with chromic catgut, then with a piece of plain gut over which a small soft-rubber drainage-tube was slipped. The flaps on each side of the gall-bladder were then stitched across and the incision carefully closed, using figure-of-8 stitches for the peritoneum, muscle, and fascia. The calculi are the usual type, composed largely of cholesterin stained by bile salts, but containing no lime salts. As to the cause of the symptoms: The direct cause was undoubtedly the cholecystitis and cholangitis, and it would be of great interest to know whether the formation of the gall-stones preceded or followed the inflammatory symptoms. Our rather extensive experimental evidence is somewhat contradictory as to the relation between cholecystitis and cholelithiasis. Cholesterin calculi have been produced experimentally by the introduction of massive doses of colon and typhoid bacilli directly into the gall-bladder. This is more apt to occur if the wall of the gall-bladder is damaged. In other words, it is possible experimentally to cause a precipitation of the cholesterin by infection. It is also possible to cause it by the introduction of cells from mucous membrane or foreign bodies, and as the bile salts are necessary to hold cholesterin in solution, a reduction in the percentage of these or the increase in the percentage of cholesterin might also cause it.

In pregnancy where there is an increase in the cholesterin content of the blood and bile and some stasis naturally accompanying the inaction of this condition, it is not difficult to believe that a mild infection of the bile or lack of normal balance between the cholesterin and bile salts would start their formation, and that, once formed, they, by their irritation, assist in developing the cholecystitis and cholangitis. In this instance our guess would be that formation of the stones preceded any marked infection of the gall-bladder or liver, but that once started it became a vicious circle, and while the symptoms were never acute or very severe, they were sufficient to cause marked pathologic changes. Babcock found that the same general type of infection gave rise to the development of a myocarditis which is frequently serious; this is absent here. We also know that the ultimate elimination of the products of protein destruction by the kidneys are dependent upon the normal function of the liver, and one cannot view these changes from cholangitis except as capable of producing serious results.

Gall-bladder surgery is serious and dangerous, and the gravity and danger is largely due not to the condition of the gall-bladder, but the damage which has been done to the liver itself, the opportunities of infection from the bile and the increased danger of producing shocks caused by the manipulation of the organs in the upper abdomen. This last, of course, emphasizes the necessity of gentleness in manipulation. In regard to the anesthetic, much greater muscular relaxation can be secured by the use of ether, and where the patient is in good condition we always use it. When there is evidence of systemic intoxication, jaundice, and failing kidney function, then gas-oxygen with perhaps a very small amount of ether is chosen. In this patient we are using ether.

In conclusion I should like to emphasize the extreme complexity of the pathology and symptoms of gall-bladder disease, the absolute need of careful individual study, and in case of operation proper preliminary preparation particularly in the presence of jaundice, and the operation itself should be performed as gently and with as little manipulation as possible.

The result of the examination by the pathologist (Dr. Wahl) was as follows: Cholelithiasis, chronic cholecystitis, and toxic hepatitis (the last diagnosis was made from the examination of some liver tissue, which adhered to the gall-bladder when it was removed).

LACTATING INTRACANALICULAR LIPOMYXOFIBRO-ADENOMA OF THE BREAST

Patient is a negress thirty-six years old. Two years ago the left breast began to enlarge. It decreased slightly after the birth of the child. Six months ago she gave birth to another child and lactation has been continuous now for two years. The tumor enlarged rapidly and has now reached very large proportions. There has been no pain, though some itching. The increased weight (1700 grams) has caused some discomfort by pulling. The skin is not adherent and the axillary nodes are not enlarged. She has been in fair health, though she has lost a little weight. The blood and urinary findings are negative. Clinically this is apparently a benign growth. However, when it is remembered that 80 per cent. of all tumors of the breast are malignant and that this percentage increases rapidly as the age of forty is reached, we shall take the precaution of having this diagnosis confirmed by a frozen section and microscopic examination.

A small portion was then removed and sent to the pathologist (Dr. Wahl), who reports that there is no evidence of malignancy. Therefore a plastic operation was carried out, using a Warren incision and preserving the nipple and leaving a breast almost the same size as the other, so the mutilation will be reduced to the minimum. An examination of this tumor shows that it is unusual. It is very large, and when cut across markedly cystic, with the cysts filled with milky fluid, yet it is very evident that it is not "chronic cystic mastitis," concerning which Bloodgood has so ably written recently. This condition is much more diffuse and often scattered throughout the breast. The remainder of this breast and the one on the left side are apparently normal.

Gross Pathology (Dr. Wahl).—The specimen consists of an unusually enlarged cystic encapsulated tumor mass derived from the breast (Figs. 754, 755). It weighs 1700 grams and measures 18 to 14 by 10 cm. It is fairly well encapsulated and has a lobulated arrangement. There is a piece of skin attached to one side measuring 21 by 14 cm. This skin is loose and is not attached firmly to any part of the underlying tumor tissue. One section of this tumor presents a very complicated and unusual picture made up of larger and smaller cystic spaces many of which show large irregular finger-like processes projecting into the lumen. Some of these cysts are as much as 3 to 4 cm. in diameter. Most of them contain a milky secretion. The cross-section through this cystic tumor mass shows that it is composed of two main parts having an inner portion which is fairly well encapsulated and separated from the outer portion. This inner portion measured 10 cm. in diameter and it differs in appearance from the surrounding portion. It is composed largely of fat, which has a mottled pale yellow and gray appearance with numerous cystic cavities within it, many of these cysts containing the same milky secretion noted above. This mass is entirely surrounded by a gray translucent tissue mottled with pink. It contains

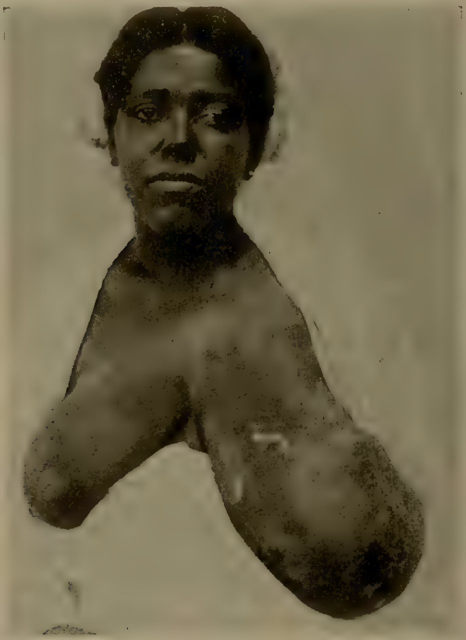

Fig. 754.—Massive lactating intracanalicular lipomyxofibroma of the breast.

numerous cystic spaces which in places communicate with one another. This surrounding tissue has a lobulated appearance and numerous cysts suggesting glandular tissue. On the other hand, the appearance of the larger internal mass suggests a fatty tumor or a lipomyxoma. The lumina of many of the cysts show irregular papillary processes protruding into them, though, in general, the walls of the cysts are smooth and there are areas of necrosis. The bulk of the tissue surrounding the internal mass is coarsely lobulated and resembles lactating breast tissue.

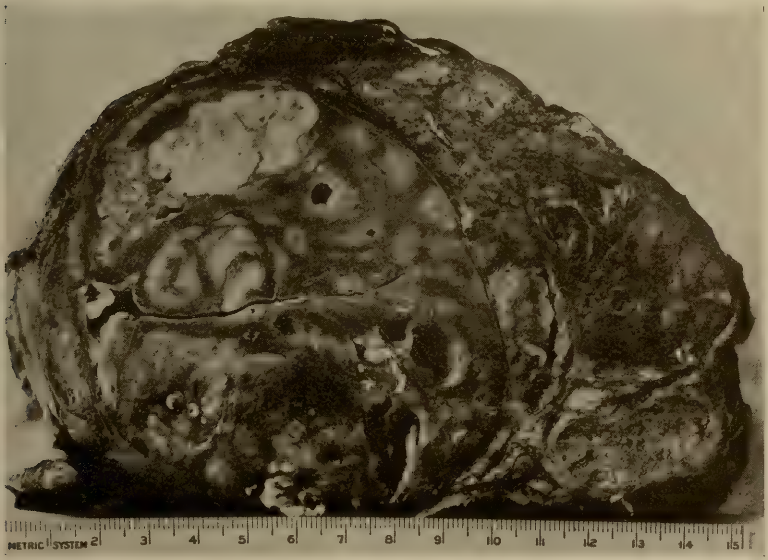

Fig. 755.—Cross-section of tumor: X indicates the tissue shown in the section.

Histologic Pathology.—The architecture is that of a cystic adenomatous growth with numerous papillary processes protruding into the lumen of these cysts forming a structure commonly designated "intracanalicular adenofibroma" of the breast (Fig. 756). There are numerous large irregular cystic spaces lined by one or two layers of cylindric epithelial cells; outside of this the stroma contains numerous smaller gland acini many of which contain an albuminous secretion suggesting lactation. In other places these solid nests of cells suggest a beginning malignancy, though in a general way the architecture is nearly normal. The stroma varies. In some places it is fibrous in character, in other places it has undergone a marked hyaline degeneration, and in still other places there is a striking tendency to assume a myxomatous or mucoid type of stroma. The stroma in some places is extremely cellular, containing many spindle-shaped cells. In other places there are very few. Certain areas show a marked inflammatory reaction in which there are numerous polymorphonuclear leukocytes. In many places this tissue is extremely vascular, and many newly formed widely dilated blood-spaces are present. In other areas this vascularity is entirely absent. There are some areas of necrosis. The mucoid areas are extremely striking. In these areas the stroma is made up of reticular fibrous tissue which takes a basic stain rather than an eosin stain. Typical lobules of lactating acini are seen separated from each other by bands of fibrous tissue.

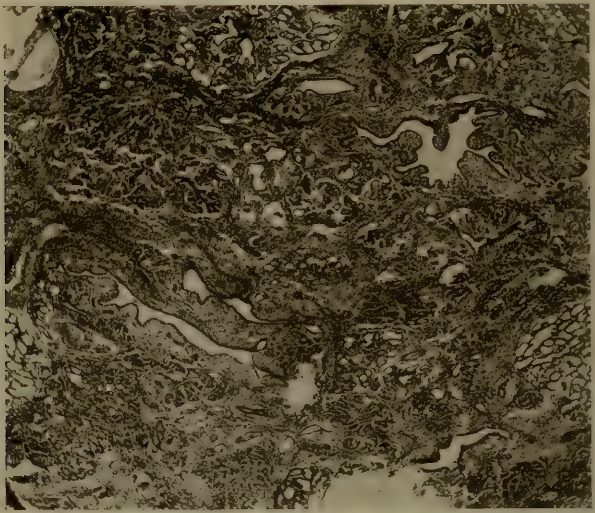

Fig. 756.—Section through area marked on Fig. 754. Magnified 80 diameters.

Diagnosis.—Massive lactating intracanalicular lipomyxofibroadenoma of the breast. There is a large lipomyxomatous intracanalicular fibroma apparently included by the main tumor mass. No evidence of malignancy.

CLINIC OF DR. H. J. McKENNA

St. Mary's Hospital

FRACTURE OF PATELLA. "MOBILE" METHOD OF TREATMENT

Here is a man who entered the hospital January 3d with a fractured patella. He is twenty-nine years old and a railroad fireman. While walking across the street he was struck by an automobile and knocked down. On trying to rise he found that his right knee was injured and he could not use it. *x*-Ray showed a comminuted fracture of the patella. This patient was put to bed and a supporting splint applied to the posterior surface of the leg. He was operated on January 10th, and you see him now two months afterward, walking with a cane and using the right leg with almost as much freedom as he uses the left.

It is not by any means uncommon to read in the literature, to hear spoken of in clinics, and to see practised the so-called operation of "wiring the patella." This method of repairing in open operation a fractured patella is, as I say, quite common. Let me say now that the operation done on this man you see here today was not a "wiring" operation. The so-called "wiring of the patella" I have never done. My first operation on a fractured patella was done in 1915, and the same operation was done at that time as was done on this man and the same after-treatment given.

Most surgeons are skeptical or even hostile when we speak of the after-treatment we employ in these cases. Only last week I saw an excellent surgeon wiring a fractured patella and following the operation the leg was put in a plaster cast. This form of after-dressing we have never used in a fractured patella. We advise and practice early active and passive movements of the knee-joint. I mean actually this, specifically this. We begin flexion of the operative joint the day of operation, immediately following the operation, the next day, and all subsequent days until recovery. We advise, encourage, and insist upon voluntary movements of the injured leg. That is, have the patient attempt to flex the leg under its own muscle power. We use no casts, no splints, no supports of any kind following the operation, only the plain gauze dressing surrounded by a bandage. When the external or skin wound is healed, all dressings are removed. Massage and active and passive motion are practised each day a little more vigorously. Don't misunderstand, the leg is not fully flexed from the first day, but only gently massaged, and mild flexion, only a fraction of a degree, which day by day is increased, a little more flexion each day.

This man who was operated on January 10th was up in a wheel chair on January 22d and on crutches January 25th. He left the hospital February 1st on crutches; he came back here on March 20th using a cane. As you see, he can walk as well without the cane as with it. The cane he claims he uses only for the sense of security it gives. Flexion here under its own muscle power is to a right angle and extension is complete. When one considers that wiring the patella followed with a plaster cast which is left on for an average of five weeks before even massage is begun, we consider that a far more crippling procedure than the one followed in this case. The operative procedure followed in this case is the one followed by us in all fractured patellæ.

A curved transverse incision is made over the center of the joint down to the site of the fracture. The blood-clots which are usually found in these cases are flushed out with a stream of saline. A purse-string suture of No. 3 chromic catgut or kangaroo-tendon is thrown around the entire patella including all fragments; in this case there were three, it being a comminuted fracture. This purse-string suture is drawn taut and tied laterally, pulling all the fragments together. Care is taken that no tissue fragments from the torn capsule are allowed to intervene between the patella fragments. Also care is taken by the aid of forceps that while pulling the purse-string suture taut the fragments meet and come into their best apposition. Following the first purse-string suture a second one is placed and tied on the opposite side. Following the purse-string sutures, beginning laterally and alternating, sutures are taken in the capsule and tied, bringing the capsule and quadriceps in approximation, a running suture is placed over this along the rent in the capsule,

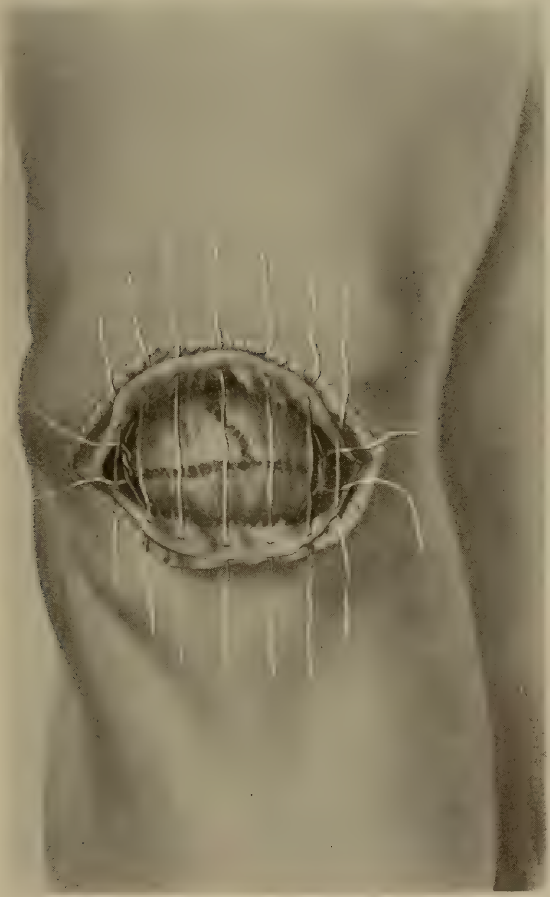

Fig. 757.

the skin sutured, and gauze dressing applied. Mild and gentle manipulation is then begun and practised on all succeeding days. We believe we get quicker and better functional results and less trophic changes in this method of joint immobilization after operation.

Our attention was first called to this so-called "mobile" method of treating fractured patella by Dr. E. Wyllys Andrews, of Chicago, in his clinic at Mercy Hospital in 1914. It looked logical to us, and we took his word for the results. We first practised it in 1915, which, as I have remarked above, was my first case, and have practised it ever since, and thus far have no reason to change.

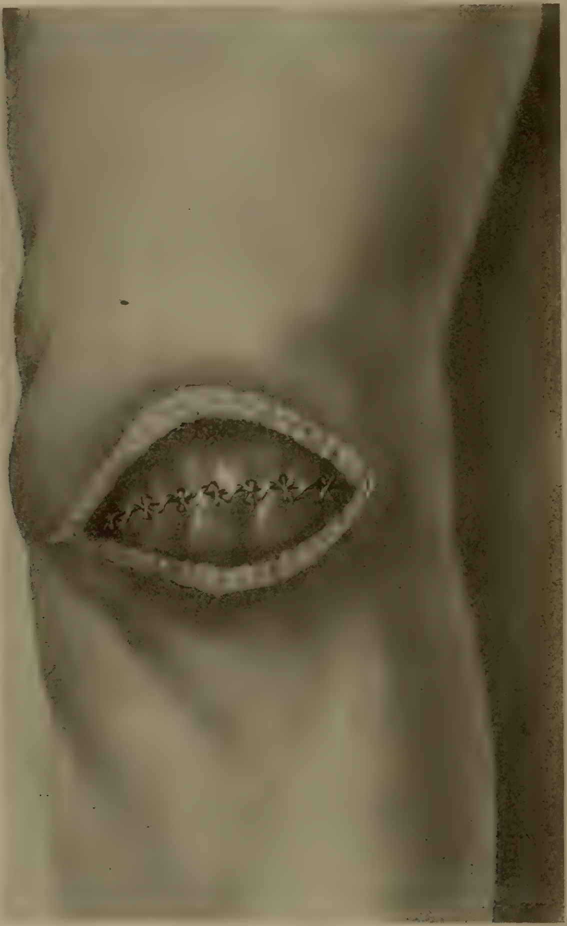

Fig. 758.

COMPOUND FRACTURE OF BONES OF FOREARM WITH GAS BACILLUS INFECTION AS A COMPLICATION

This Italian boy aged seven years came into the hospital June 15, 1921, giving a history of having fallen and injuring his left forearm. The left forearm showed on examination a compound fracture of both bones just above the wrist. The wound was cleaned with a 5 per cent. phenol solution and tincture of iodin and débridement done. There was no separation of tendons. The fractures were reduced and a posterior splint applied with a bandage. Antitetanic serum given. The next morning the hand and arm were swollen and temperature was $102\frac{4}{5}$° F. The intern, on seeing this swollen condition, thought it due to too tight bandaging, so loosened the bandage. In the afternoon of the same day the intern became suspicious of something besides too tight bandaging as the cause for the swelling and peculiar condition of the tissue. Dr. E. L. Miller saw the case, and suggested multiple incision along the arm, which the intern made. The next morning I saw the patient. He had had the arm immersed in hot boric solution. There was a peculiar odor, and to those who have smelt the odor of gas bacillus the condition was readily recognized. The incisions made previously in the arm had not gone through the fascia. The fascia was then incised, and the muscles, which had a peculiar parchment-like feel and crackle, bulged out; the hand and lower third of forearm were markedly shriveled. The arm was again immersed in hot boric acid solution. The afternoon of this same date the boy's temperature went to $104\frac{8}{10}$° F. The hand and forearm were more markedly shrunken. The following day (June 18th) the patient was markedly toxic, temperature 104.8° F., and pulse 160 or above. It was decided that a guillotine operation as near the shoulder-joint as possible was the only procedure left as an attempt to try to save his life. There was crackling in the tissue of axilla and around the shoulder.

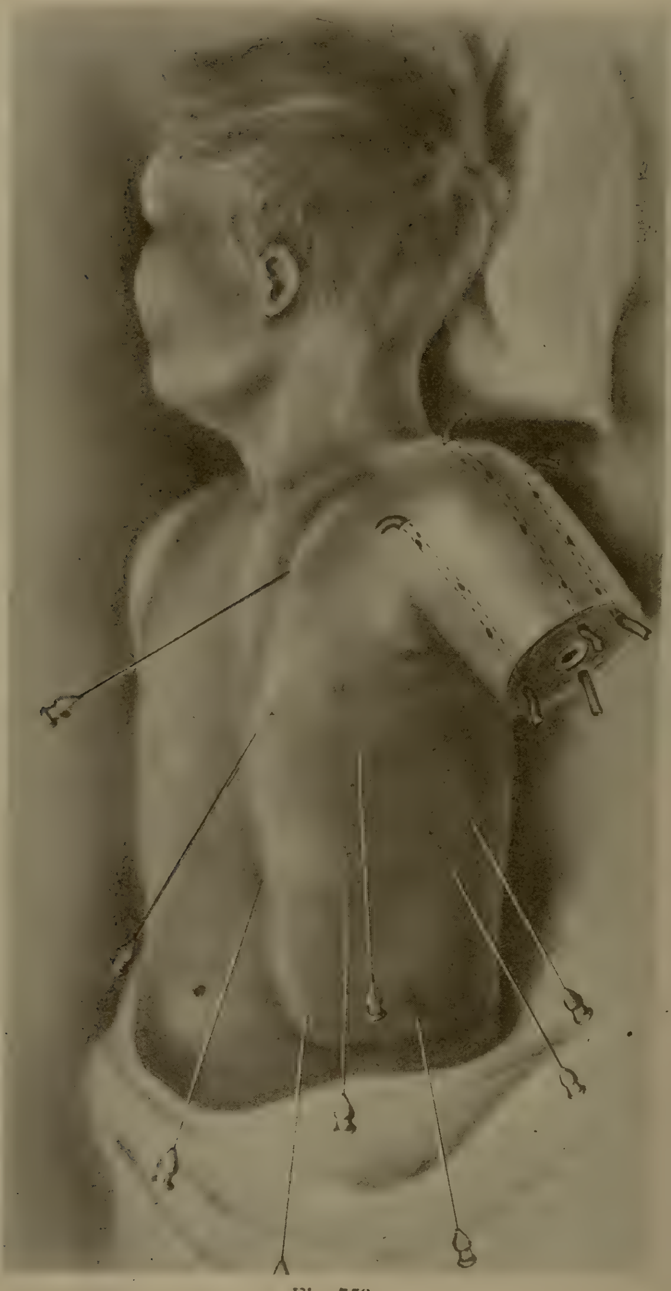

Fig. 759.

The patient was taken to the operating-room, and under ether anesthesia a guillotine operation done 2 inches below the joint. Three rubber drainage-tubes fenestrated several places were run from the point of the shoulder, sides, and axilla down to the site of amputation. The patient was in the operating-room five minutes from start to finish. He was then removed to his bed and irrigation of peroxid of hydrogen begun through tubes. Oxygen was injected into tissue by means of needles attached to rubber tubing connected to oxygen tanks.

Oxygen was injected into the tissues, beginning a considerable distance from the shoulder, down about the waist line and over to midline of chest and back, gradually working toward shoulder. Injections were given twice daily. Irrigations of peroxid of hydrogen were given every two hours. Patient's temperature the following day went to 102° F., and then on the 21st it went to $102\frac{}{5}$° F. From that time on both pulse and temperature became normal. This patient was up in a wheel chair on the 22d, but peroxid of hydrogen irrigations and the oxygen were kept up. The tubes were removed on the 23d and the irrigations continued through tube sinuses. The oxygen injections were discontinued on the 23d. This patient went on to a recovery. On July 18th skin-flaps were dissected up and the bone cut off about an inch up and the flaps brought down over stump.

It was probably a mistake in judgment on our part in waiting as long as we did before doing the guillotine amputation.

EXOPHTHALMIC GOITER WITH ACUTE MYXEDEMA COMPLICATING POSTOPERATIVE CONVALESCENCE

Surgeons are about the only members of the profession who consider that most forms of goiter require surgical treatment for their permanent relief. We say most forms of goiter because there is one form or type of goiter, the so-called colloid or adolescent goiter, occurring in girls up to the age of twenty-three which surgeons feel is not surgical. Marine and Kimball have really done a monumental work in demonstrating that this type of goiter is subject to cure and prevention by the proper administration of iodin. The prevention of this type of goiter means vastly more than the elimination of cervical deformities. It means, in addition, the prevention of those forms of physical and mental degeneration, such as cretinism, mutism, and idiocy, which are dependent on thyroid insufficiency. Further, it is possible that it would have some influence in preventing the development of thyroid adenomas; these adenomas, for all we know, may be due to the same stimulus which causes the colloid enlargement. These adenomas, once their growth is initiated, are not controlled by iodin. The fact that adenomas possibly develop from fetal rests is another indication that they may be due to the same stimulus as the colloid. We know the simple endemic or colloid goiter most commonly develops during one of three periods, namely, fetal life, around the age of puberty, and during pregnancy. So if we have iodin influencing the simple or colloid goiter that may develop during fetal life, so also it may influence the adenoma which probably develops at this period and possibly from the same stimulus.

However, this case that we are presenting here is not one of these types, but the exophthalmic type, and from now on we will try to confine our remarks to this type. It is this type that is considered more particularly by surgeons as a strictly surgical disease, in that surgery will give the earliest, the best, and the most permanent results.

The facts upon which the feeling against operative treatment for exophthalmic goiter are based seem to be, first, the permanence of operative results have been questioned; second, these cases have been considered notoriously bad risks, and third, numerous non-operative procedures have been exploited. These views have fostered an aversion to operation which has resulted in harm to many patients. With these preliminary remarks we will proceed with the case at hand.

This girl, aged twenty-two, gives a history of having had influenza three times, the first time in 1918. She had diphtheria two years ago and tonsillitis many times during childhood. She had quinsy following the diphtheria. Her tonsils are out now. In January, 1921 she began to notice shortness of breath and palpitation of the heart, which she attributed to her gain in weight. These symptoms became so annoying that she had to leave school. Her home doctor saw her and told her she had a goiter. He put her to bed on a light diet. She remained in bed six weeks, during which time she lost in weight, from 125 to 110 pounds. Her pulse on going to bed was 140; this gradually came down to 110. After getting out of bed she again gained weight and pulse again creeped up to 135. Her shortness of breath came back on her, and she noticed considerable weakness on exertion. She still has attacks of palpitation, frequent headaches, and attacks of melancholy. She is very nervous and very sensitive, gets hot quickly, and perspires easily and frequently. Her blood-pressure is systolic 142 and diastolic 82. Pulse-rate 135. Some exophthalmos. The patient says she has always had prominent eyes. She has a marked tremor of hands.

She entered the hospital June 4th. On June 5th her basal rate was plus 32. Her pulse-rate 120. She was put on light diet and kept in bed. On June 11th another basal rate was run and it was plus 36. Her pulse was 96. She was operated June 13th under gas-oxygen anesthesia. The regular collar incision was made through skin and platysma; the fascia split centrally and muscles retracted, not cut. The thyroid gland was exposed and brought forward with tenacula. Four-fifths of the right lobe and two-fifths of the left lobe with isthmus were removed.

Section of thyroid showed hyperplastic goiter with areas of necrosis or degeneration. Patient was returned from the operating-room in considerable shock, her pulse was 160. Hypodermoclysis of saline with digalen and morphin were given. Hypodermoclysis was given by the gravity method and was continuous. On June 14th her temperature went to 102.8° F. and she was surrounded with ice-bags. It then dropped to 100° F. On June 14th proctoclysis of 5 per cent. glucose and 3 per cent. sodium bicarbonate was begun. She gradually improved.

From the first she was never able to retain anything on her stomach. On June 14th she complained of headache and sleepiness, very apathetic, pulse very slow; she would fall asleep while the neck was being dressed in sitting position. Skin dry. We took these symptoms to be due possibly to an acute myxedema from a too sudden drop in metabolism. Thyroid extract, gr. $\frac{1}{2}$, was ordered to be given three times a day. Her sleepiness and apathy after three days began to clear up. From this time on her convalescence was normal and she was up in a wheel chair June 27th. A basal rate was run June 28th and was plus 4. She left the hospital July 3d. Whether or not these symptoms of apathy, sleepiness, headache, etc., were of a truly myxedematous origin we cannot definitely state, but we could find no other cause for them, and therefore take this condition to be due to the sudden drop in metabolism. Acute myxedema, we are well aware, is a rare sequel of thyroidectomy, and this is our first experience with such a case.

CLINIC OF DR. JOHN G. HAYDEN

St. Luke's Hospital

THREE CASES OF TRAUMATIC SURGERY

I wish to present for your consideration 3 cases which have proved rather unique in my experience, and I hope will be of interest to you.

CASE I. TRAUMATIC VENTRAL HERNIA WITH INJURY TO MESENTERY

W. C. B. Male. Age twenty-three. Weight 135 pounds. Switchman. Admitted to St. Luke's Hospital August 8, 1921. Discharged August 31, 1921.

Complaint.—Severe pain and tumor of abdomen.

History of Trouble.—Patient has always enjoyed the best of health, working every day. August 8, 1921, about 11 P. M., while working between two cars on a curve, was caught through abdomen and small of back by "deadwood" on ends of cars. Was pinned between the cars, and it was not until the cars were pulled apart that he was able to extricate himself.

Was not able to stand after the cars separated because of extreme pain in his abdomen and weakness, and he fell to the side of the tracks. Taken immediately to St. Luke's Hospital, where he arrived about 12.30 A. M. On admission his pulse was 74, temperature 97.6° F. He was suffering considerable pain in his abdomen, felt cold, and on examination a hernia about the size of a navel orange was protruding subcutaneously through the abdominal wall, just below the umbilicus. The skin covering the tumor mass was excoriated and badly bruised. Bowel was demonstrable to palpation in the tumor.

Operation.—Immediate operation was decided upon, and under ethyl-chlorid-ether anesthesia a transverse incision 5 inches long was made over the swelling. Immediately, on cutting through the skin, small gut came into view. Both recti were plainly visible, the anterior and posterior sheaths having been torn, as was also the fascia and peritoneum.

Much to my surprise, very little, in fact, practically no hemorrhage was found. On stripping the small bowel a piece of ileum 6 inches in length, from which the mesentery had been torn, was found. The bowel itself gave no evidence of injury.

The patient being in good condition, a complete operation was decided upon, and the bowel from which the mesentery had been torn was excised and a lateral anastomosis made.

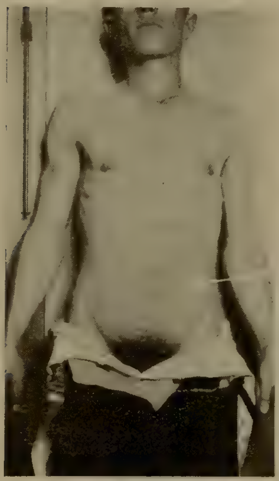

Fig. 760.

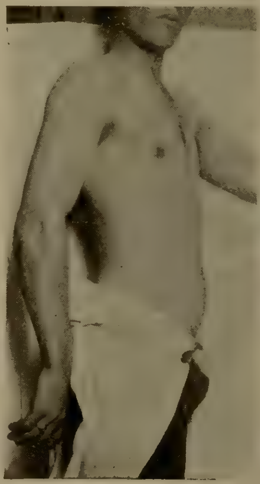

Fig. 761.

Closure of the abdominal wall was made in layers, using twenty-day chromic gut, following the principles of the Mayo operation for umbilical hernia. Rubber tissue drain in subcutaneous tissue.

Immediate postoperative condition was fair. Pulse 110. Respiration 20.

Was placed in Fowler's position, given morphin, and normal salt solution by Murphy method.

Bowels moved with enema on the second day; on the third day the pulse and temperature reached normal, and his recovery following this was without incident, other than a very superficial slough of the injured skin. This healed promptly under a screen cage and electric light. Skin sutures out on twelfth day and allowed to get up.

After returning to his home he gradually became more active and he was able to return to his usual occupation in two months from the date of his injury. He has worked steadily since.

On September 6, 1921 he was given a barium meal and an *x*-ray taken of his intestinal tract. From the film it was impossible to tell where the anastomosis had been made, other than what appeared to be a slight hesitation at one point in the progress of the barium shadow.

Result.—Cured.

Comments.—The favorable outcome of this case is attributed largely to the fact that there was practically no bleeding and early operation.

The photograph shown was taken September 15, 1923. He is entirely well. In connection with this case I wish to report another case of traumatic hernia.

CASE II. TRAUMATIC HERNIA OVER CREST OF RIGHT ILIUM

A. M. Male. Switchman. Age forty. Weight 230 pounds. Admitted to St. Luke's Hospital December 6, 1909. Discharged December 17, 1909. Re-admitted December 28, 1909. Final discharge January 24, 1910.

Complaint.—1. Extreme weakness. 2. Severe pain in right lower quadrant of abdomen. 3. Pain in left thigh.

History of Trouble.—States he has always been in good general health. December 6, 1909, while switching cars, was caught between a box-car and loading dock and rolled. Unable to stand because of severe pain and weakness after being removed from between car and loading dock. Was taken immediately to St. Luke's Hospital.

Examination.—On admission he showed considerable shock, was cold. Pulse rapid.

General.—Negative.

Local.—Was very tender to pressure over his left hip and right lumbar region. Ecchymosis showing in these locations.

Treatment.—Was put to bed and restoratives administered and treated locally with heat. Required morphin for the relief of pain.

He promptly recovered from the immediate effects of his injury and left the hospital on the eleventh day, able to walk, but still lame where he had been injured.

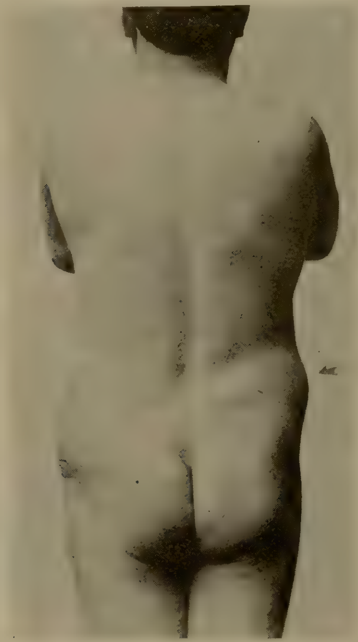

Fig. 762.

Subsequent History.—Five days later he came into my office and I found just above the crest of his right ilium a tympanitic, partially reducible tumor mass about the size of an adult fist (Fig. 762). The injury to his left thigh proved to be only a bruise. At this time the secondaries of syphilis were also noted.

Diagnosis.—Traumatic hernia.

Operation.—December 29, 1909 (twenty-three days following injury), under ether anesthesia, a longitudinal incision was made over the bulging mass above the crest of the right ilium and bowel was encountered subcutaneously. The muscular attachments to the crest of the ilium had been torn off slick and clean.

Inasmuch as operation had been delayed as long as it was, the bowel, principally cecum, was adherent in the subcutaneous tissues. The incision was extended upward until normal abdominal wall was found and the peritoneal cavity entered. It was fairly easy, once within the abdomen, to free the torn edges of the peritoneum and bowel and to return the bowel to the abdominal cavity and close the peritoneum. As would naturally be expected, the muscles which had been torn from their attachments had retracted, and this was found to such an extent it was impossible to bring them again to the crest of the ilium without undue tension. Consequently the incision was extended downward and a flap of fascia lata with its attachment to the crest of the ilium was reflected upward and the torn muscles and fascia sutured to this, using twenty-day chromic gut. Subcutaneous drainage. The wound healed without infection. After two weeks in bed and under antisyphilitic treatment the patient was allowed to sit up. The suture of the abdominal muscles to the fascia lata held, and on discharge from the hospital twenty-seven days after the operation there was no bulging. He passed from under my observation, but I heard from him later and saw him again. At this time there was a hernial protrusion anterior to where he had his original hernia.

This man never returned to his usual work, but the last I heard from him, about five years later, he was conducting a small mercantile business.

Result.—Improved.

Comments.—Both these cases were genuine traumatic herniæ, and they ran true to form, illustrating that in this condition there are serious primary symptoms and possibly associated injury; that the hernia has no peritoneal sac and becomes irreducible in a short time.

CASE III. TRAUMATIC BURSITIS OF RIGHT PALMAR BURSA

R. W. M. Age forty-four. Mechanic. Entered St. Luke's Hospital November 29, 1922. Discharged December 27, 1922. Result: Improved.

Re-admitted April 18, 1923. Discharged May 31, 1923.

Complaint.—Pain and tenderness in palm of right hand.

History of Trouble.—Says he had always been in good general health and able to pursue his work as a mechanic up until the latter part of 1922. On October 25, 1922, while guiding a driving rod (weight about 4000 pounds) of an engine, on to pin, the strap on the jin pole broke, letting the driving rod fall about 30 inches.

After the rod had fallen it tilted over, catching right hand between it and hub of drive wheel. Was able to get hand out without assistance.

Immediately afterward his hand pained him some in the region of the fifth metacarpal bone, but he kept at his work. Next day his hand hurt him so much that he consulted a physician, who put a pad in the palm of his hand and bandaged it tightly. This same day thinks he noticed swelling on the ulnar side, palm of hand.

The pain in his hand persisted, being sufficient to keep him awake nights, and eleven days later he quit work because of the pain and swelling in his hand. Did no work and received no treatment for twelve days, when he again attempted to resume his occupation, but had to quit after two days. During this time had consulted a second physician, who put the hand in a molded plaster splint. He was wearing this when he entered the hospital.

Examination.—*General.*—Negative.

Local.—Just above the annular ligament on the ulnar side, flexor surface, of the right wrist, is a swelling about 1 inch in diameter and only slightly elevated above the skin level. When pressure is made over the swelling, which is moderately tender but not red, and the hand palpated below over the hypothenar eminence, a fluid, in which it appears small bodies are floating, is felt coursing beneath the annular ligament. Pressure over the hypothenar eminence reproduces the swelling in the wrist.

Blood and urine negative.

Blood Wassermann negative.

An x-ray of the hand made at this time was reported negative.

First Operation.—November 30, 1922, under local anesthesia, the swelling above the annular ligament was aspirated and about 5 minims of a clear fluid withdrawn.

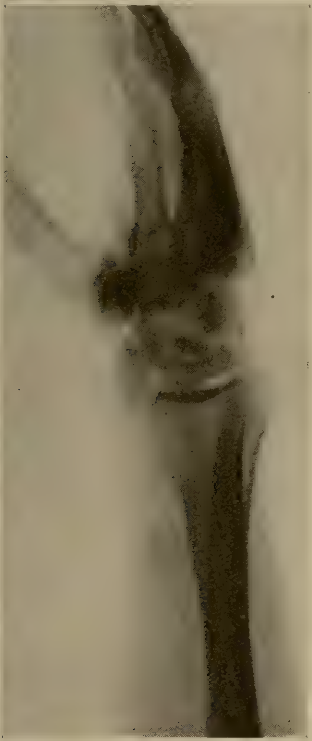

Fig. 763.

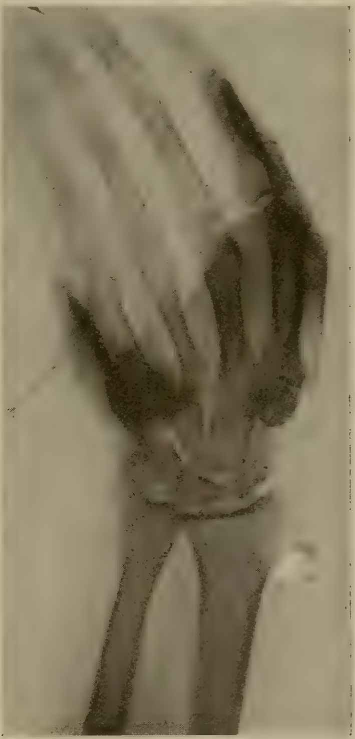

Fig. 764.

This was examined microscopically and found to contain a few red cells, leukocytes, and large mononuclear cells.

Postoperative Course.—The hand was again put in the splint, and in a few days he began soaking his hand in hot water. December 23d he left the hospital, his hand not paining him, and with swelling and tenderness practically gone. His hand, however, felt somewhat stiff.

Early in January, 1923 he awakened one morning to find his hand pained him again. Pain has persisted and swelling had returned when I saw him on March 9, 1923. At this time he was having as much distress as he ever had, and was again unable to work.

April 18, 1923 he was re-admitted to the hospital, primarily for acute alcoholism. On his recovery from this he was transferred to my service.

In order to demonstrate that the palmar bursa was involved the swelling above the wrist was injected with a 25 per cent. sodium bromid solution and *x*-ray films made. These showed "a shadow quite wide and extending practically along the entire length of the fifth metacarpal bone" (Figs. 763, 764).

Second Operation.—April 24, 1923, under ether anesthesia, an incision was made into the swelling above the annular ligament and into the bursa below the annular ligament without dividing this structure. A bloody fluid escaped. No solid particles were found in the fluid, although before injection with the sodium bromid they had seemed to be present. Connection, between the parts opened, under the annular ligament was easily demonstrated with a probe. The walls of the bursa were considerably injected, but there was no evidence of pus. Curetage of the bursa was done and the wound closed without drainage. The day of the operation, *i. e.*, one day following the injection of sodium bromid, a bleb $\frac{3}{4}$ inch in diameter was noticed over the bursa. This was drained and an alcohol compress applied as part of the postoperative dressing. A plaster splint was molded to the hand and forearm.

No infection of the operative wound or bleb occurred, but a moderately deep necrosis at the blister site occurred, which was slow in healing.

He was discharged from the hospital forty-nine days after his operation as cured, his prolonged stay in the hospital being due to the slow healing of the slough at the bleb site. I have seen him since; he is working and is having no evidence of any bursal trouble.

Comments.—The history, physical examination, *x*-ray, laboratory, and operative findings prove beyond doubt that this was a case of palmar bursitis, probably caused by his injury. It was thought "rice bodies" would be found in the fluid, but they were not present. Possibly the sodium bromid injection may explain this.

The prompt recurrence of this man's symptoms following simple aspiration and rest indicate that this treatment is not sufficient, and what happened in his case is what usually occurs, *i. e.*, prompt recurrence of the trouble.

In order to affect a cure more radical means must be applied, and a destruction of the bursal walls accomplished. This may be done by thorough cureting or by packing the wound with gauze, allowing it to heal by granulation.

CLINIC OF DR. CLARENCE B. FRANCISCO

University of Kansas, School of Medicine, Department of Orthopedics

PRESENTATION OF CASE OF TUBERCULOSIS OF THE KNEE ONE YEAR AFTER EXCISION OF THE JOINT

Mr. E. D. (Hospital No. 11,644). This man was admitted to Bell Hospital January 6, 1922. Discharged March 14, 1922.

Diagnosis.—Tuberculosis of right knee.

History.—Six years ago patient worked on a machine that required using a lever with the side of his right knee, and observed that his knee was stiff and sore at times; had some swelling but not much disability, and continued at work. Was treated here in the Dispensary at that time (1916), having the knee strapped, and condition improved; then was worse for a while. He continued having these relapses every few months, gradually getting more and more disability, but has been up and about all the time, although for the past six months has been on crutches and having considerable pain, some loss of weight, and a little fever.

Physical Examination.—Well-developed and nourished man, weighing 142 pounds, comes in walking with a cane and crutch; right knee in flexion of 135 degrees, with only about 5 degrees motion, marked muscle spasm and capsular thickening; no abscess or sinuses; other joints negative, general condition fairly good. Wassermann negative; urine negative.

***x*-Ray.**—Shows erosion and bony destruction of both condyles of right femur, also head of tibia (Fig. 765).

Family History.—Negative for tuberculosis, cancer, and rheumatism.

Past History.—Negative for disease or injury. Has been an athlete, his specialty being sprinting.

Operation (January 10, 1922).—A curved incision was made on the anterior surface of the knee and carried down into the joint. A great deal of tubercular inflammatory tissue was dissected out; the leg was flexed and a portion of the tibia sawed off, and also the condyle of the femur sawed off square, the cartilage was stripped off the patella, the lower part of it approximated with the tibia; the surfaces of the tibia and femur were then painted with pure carbolic acid and followed by alcohol; bleeding vessels were ligated and the incision closed in layers. The ends of the bone were sawed at such an angle as to permit 15 degrees flexion when they were in perfect apposition. This is the most important part of the technic. A plaster spica was applied in this position.

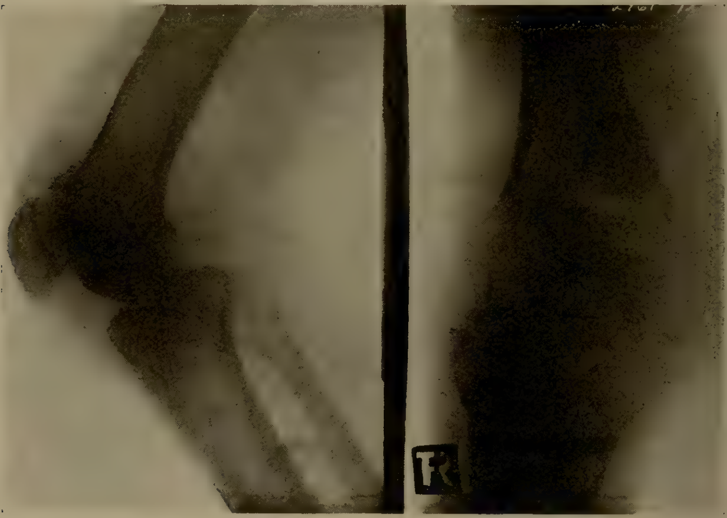

Fig. 765.—Before operation.

Pathologic Report.—The section shows considerable acute and chronic inflammatory tissue with foci of lymphoid cells here and there. In some areas there are foci of epithelioid cells in the center of which there is some caseous multinucleated giant-cells, the picture being typical of tuberculosis.

Diagnosis.—Tubercular synovitis and tubercular arthritis. (Signed, W. R. Wahl.)

Progress Note (March 14, 1922).—This man's knee is about in the right attitude, being about 165 degrees extension, union fairly firm, but *x*-ray shows lack of calcification of callus. Told to wear a support for a year.

This man came in today, March 17, 1923, or fourteen months after his operation, and these pictures were just taken (Fig. 766). You can see that he has a strong, firm, bony union. No motion can be demonstrated in his knee, and he has been symptom free, but has only been without the support for two and half months and still feels the necessity of protecting the joint. On the whole, his condition is satisfactory, and there is every indication that the diseased process has entirely stopped and there is not much danger of it ever flaring up again.

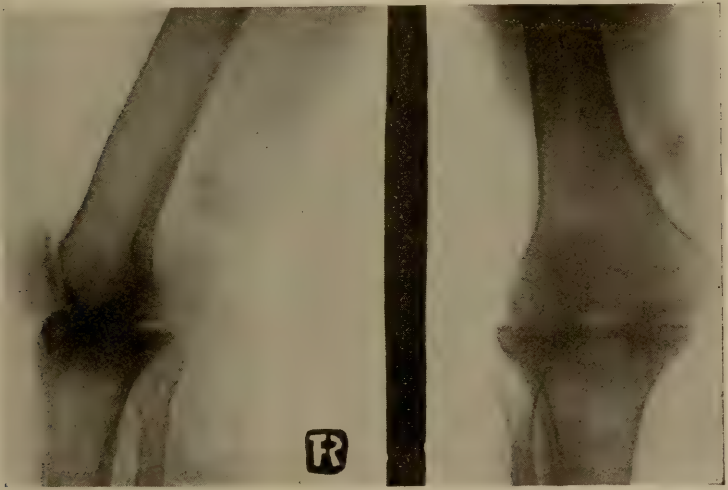

Fig. 766.—After operation.

Conclusion.—The early diagnosis of tuberculosis of the knee-joint in the adult is difficult. In my opinion any chronic condition of the knee with no other joint involvement, that has never been acute, should always be considered tubercular until proved otherwise, and that as soon as the diagnosis is established the joint should be excised, and it is not necessary to use any grafts or extra sutures to secure union if the surfaces of the tibia and femur are brought into perfect apposition. A support should be worn for a year.

PRESENTATION OF CASE OF BONY ANKYLOSIS (FROM A NEISSERIAN INFECTION) OF KNEE-JOINT AFTER EXCISION, ILLUSTRATING COMPLETE FIRM UNION IN THREE MONTHS

M. G. (Hospital No. 12,734). Colored. Age twenty-eight years. This patient was admitted to Bell Hospital January 1, 1923. Discharged January 22, 1923.

Diagnosis.—Bony ankylosis of left knee.

History.—Twelve years ago left hand suddenly swelled and became painful, lasting two days, then right hand became painful and swollen for about three days, then left knee became swollen, painful, and stiff, confining the patient to bed for two months with extreme suffering; then she began gradually getting about, and has used a crutch since, not on account of pain but on account of deformity.

Physical Examination.—Comes in walking with one crutch with left knee fixed in the attitude of 145 degrees extension, no thickening of the capsule, no spasm and no tenderness, but some atrophy of thigh and calf muscles; otherwise negative and is a strong and well-nourished woman, weighing 150 pounds.

***x*-Ray.**—Shows bony ankylosis of the knee-joint (Fig. 767).

Wassermann negative. Urine negative.

Operation.—Elliptic incision was made about the knee; knee-joint opened, a wedge-shaped piece of bone was removed in order to overcome the half-flexion, the wedge being fashioned in such a manner as to permit 10 degrees flexion when the ends of the bone were in perfect apposition. Wound closed in layers. Spica cast then applied.

Pathologic Report.—Bone fragments, nothing found. (Signed, W. R. Wahl.) This patient came in today, April 7, 1923, or three months after operation, walking without crutches, is entirely symptom free, but has been wearing her cast, which was just removed and these pictures made (Fig. 768). You will note there is firm bony union with just the right amount of flexion and the patella is mortised in a position that gives great stability to the joint. We will allow all support to remain off and give her complete freedom of the leg.

Conclusion.—This case illustrates the usual end-result of gonorrheal infection of the knee in a growing individual. The usual end-result in the adult is a fibrous ankylosis and a very painful joint, which, in my opinion, should be resected or mobilized. In this case we operated merely to straighten her leg, and did not consider a plastic operation for the reason that the muscles that move her knee have been out of commission for twelve years and probably could not have been trained to again take up their function; also because she has not the time and finances to enter into a long questionable procedure. These points should always enter into the consideration of whether you will attempt a resection or a plastic operation. In doing a resection you know what your end-result is going to be, but in a plastic it is uncertain, and in this case I feel sure we have chosen wisely.

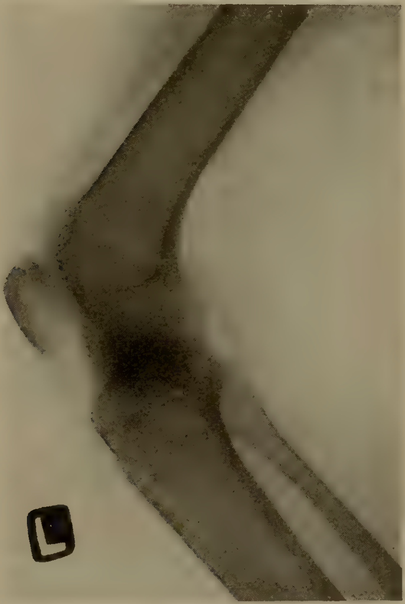

Fig. 767.—Before operation.

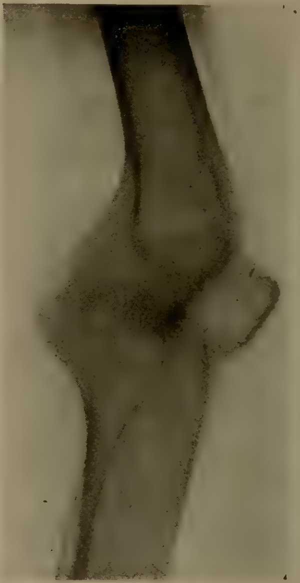

Fig. 768.—After operation.

CLINIC OF DR. ROBERT McEWEN SCHAUFFLER

Research Hospital

SOME COMPLICATIONS FOLLOWING INTERNAL FIXATION IN FRACTURES OF THE FEMUR

Our first case this morning is for a resection and suture of the external popliteal nerve, near the head of the fibula, for paralysis. This is only one of the many troubles to which this unfortunate patient has been subjected. A year ago he suffered a simple fracture of the left femur. He was treated from the start in a hospital by a general surgeon who cut down on the fracture and made an Albee slide inlay and then put the limb up in a plaster cast, which was replaced on several occasions. The patient suffered great pain in his leg and foot as well as in his thigh. At the end of five months, when I first saw him, he was still in bed at the hospital with a malunion of the femur and an inward angulation of 40 degrees (Fig. 769). The limb was mummified; there was a paralytic drop-foot with marked organic contraction of the tendo achillis; no evidence of power in the dorsal flexors of the ankle or toes. A tenotomy of the tendo achillis was made and the foot fixed at a right angle. The patient was then given vigorous physiotherapy for six weeks, after which the malposition of the femur was corrected by operation. It was deemed undesirable to introduce any foreign material, even bone, if it could be avoided. A narrow V-shaped piece of bone was removed with the broad end outward, and the limb was pushed inward, fracturing the inner callous bar which furnished an excellent backstop against reversing the displacement. Figure 770 shows the *x*-ray taken soon after operation, and Fig. 771 about seven weeks after. The patient was placed in a Thomas splint in bed, and after six weeks gotten up on an ambulatory splint. There was little tendency to displacement and the result was a sound, bony union on which the patient has been walking for four or five months.

After union of the fracture was assured, external heat, diathermia, and massage were used vigorously. There was some improvement in the circulation of the leg and the knee-joint was gradually flexed to 40 degrees. The external popliteal nerve was exposed over the head of the fibula, to which it was found to be adherent; it was freed and transplanted to a fat bed outside of the deep fascia. There is no doubt that the injury to the nerve was caused by it being pressed too tightly against the head of the fibula by the plaster cast. After six months there has been no sign of recovery of the paralysis, and it is proposed now to resect the portion of the nerve which has been subjected to pressure and suture the fresh ends. There is some power in the calf muscles and the flexors of the toes, but the stiffness of the joints does not

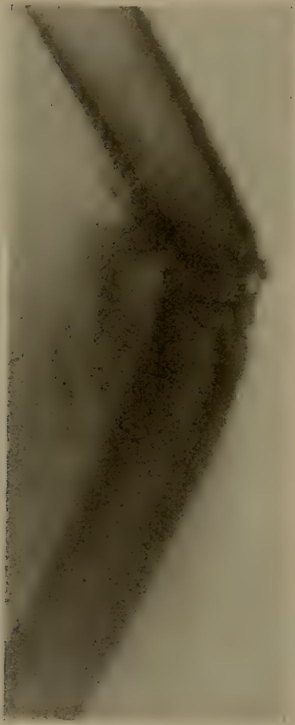

Fig. 769.

Fig. 770.

permit of any considerable motion. The operation at this time is more or less a counsel of desperation. As far as the nerve is concerned it ought to succeed, but it is a question as to whether the muscles are not so completely wasted and converted into scar tissue that they will be unable to respond to any central impulses which may get through. We are all familiar with that terrible condition, known as "Volkmann's ischemic paralysis," in which the limb is contracted, painful, and useless. It seems that the muscles are converted into fibrous tissue, the circulation almost destroyed, and the nerve supply severely interfered with. We have found this condition caused by too tightly applied splints and bandages, or the limb swelling against inelastic bandages and producing the same effect. We know, however, that it can

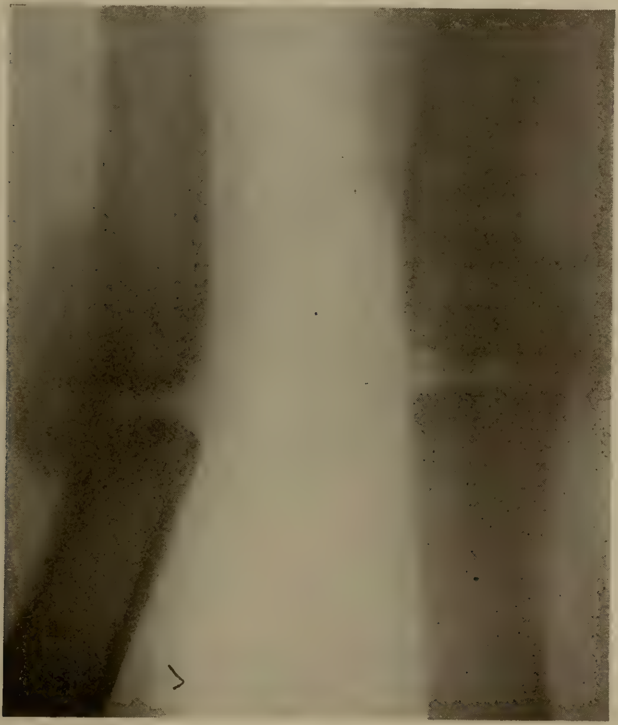

Fig. 771.

occur as the result of hemotoma beneath the deep fascia making pressure on the vessels and nerves; and that it has occurred in some cases where no splints or bandages have ever been applied. Recent experiments by Dr. Barney Brooks, of St. Louis, have shown that when the arterial supply was left intact to a large muscle which had been isolated and the venous return almost completely shut off, the muscle underwent an intense round-celled infiltration, as if it were the site of an acute inflammation, and was then converted into a mass of scar tissue exactly like the condition found in Volkmann's ischemic paralysis. It seems to me that I am constantly seeing lesser degrees of this ischemic paralysis or fibroses of limbs and that they are due to just the causes set forth above. Practically they are the result of too much manipulation or operation and interference with the circulation by retention in splints or casts which were applied too tightly. In a few cases they may be due to a hemotoma, often following a severe contusion or a simple fracture, and the trouble could have been prevented by incising the deep fascia and relieving the pressure.

The second case which we have for operation this morning is a man fifty-four years of age who sustained a simple fracture of the femur eleven months ago. He was subjected to open operation with the use of a metal band, which was followed by suppuration and long-delayed union with projection of one of the fractured ends, which was cut back by the doctor, finally resulting in malunion with persistent suppuration. The patient comes to me now with no hope of having the position of the leg corrected, but to get rid of the discharge. The *x*-ray (Fig. 772) shows that the bone at the apex of the spur is undoubtedly dead, but it is quite difficult to decide just how much other bone is dead or how much of it is newly formed bone. We will inject into the sinus a methylene-blue solution under some pressure, and hope that it may guide us to any deeper portions of necrotic bone. We expose the angulated femur at the site of malunion by an external incision, and we see that here is quite a good-sized piece of bone which is dead and which we can pull away with the forceps. You see it is deeply stained with the methylene-blue. As we retract further about the site of malunion no further dead bone can be seen, but there is a small tunnel going somewhere into the interior of the bone which is stained with the blue. We are now cutting through healthy bone with the chisel; after removing several thick shavings of bone you see we have come to an area which is stained blue, and by working around this a little more we are

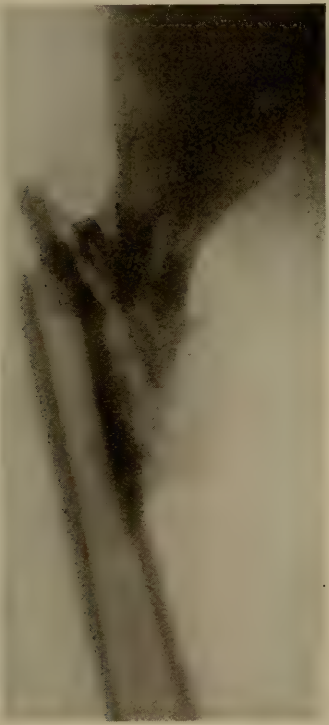

Fig. 772.

able to remove a second sequestrum, part of which can be lifted out; there is a bit toward the inner side which is more or less entangled in the new bone and which we will remove with the small chisel. Now, when we mop out with salt solution, you see there is no more blue stain anywhere in the depth of the wound. If you look at the pieces of bone, laid out on this towel, you can see clearly the dead bone stained blue and the healthy bone, which was removed to uncover the deeper parts of dead bone, a bright pink. The use of methylene-blue injection has been often helpful to me in recovering bits of dead bone which I might otherwise have left in and so failed to give complete relief.

In the last year I have had 3 other cases, 2 of which were even worse than these we have seen this morning. All of them were simple fractures of the femur and were converted into compound fractures by the surgeon. Each resulted in delayed union, malunion, and such injury to the soft parts as to constitute a permanent disability far worse than that due to the bad position of the bones. I think this can be stated almost as an axiom: "If you are not a master of external fixation any attempt to get away by internal fixation of a simple fracture of the femur will incur serious danger of delayed union, suppuration, and malunion, with exten-

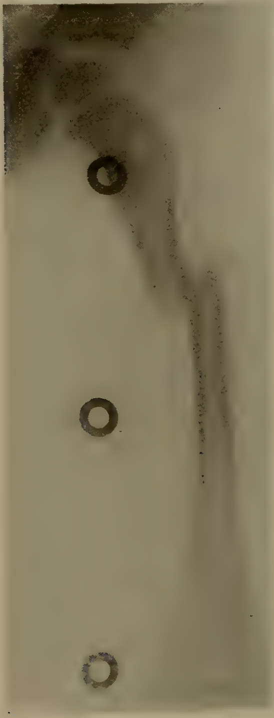

Fig. 773.

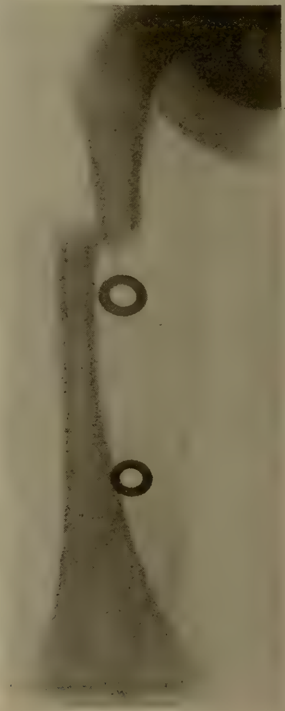

Fig. 774.

sive injury to the soft parts." If you are a master of external fixation, then internal fixation is seldom necessary in a simple single fracture of the femur. The use of skeletal traction by ice-tongs enables us to handle a number of cases which we could not sufficiently control by skin traction. About the only cases of simple fracture of the femur which should be operated upon are those in which the fractured ends are so irregular that, without exposure, there is little hope of even fair coaptation, and those in which there is muscle interposition.

Fig. 775.

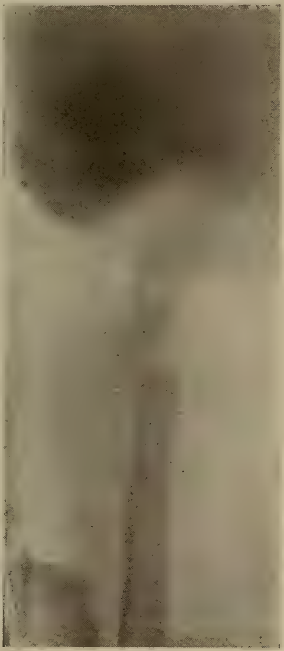

Fig. 776.

I have asked the mother of this little girl to bring her to the hospital this morning to illustrate a case in point where operation was absolutely necessary—a case of muscle interposition between fragments. This was a healthy child of three years who sustained a transverse fracture of the lower end of the upper fourth, the bone being broken across a narrow rail by an adult falling across the thigh. The limb, which was at nearly a right angle, was straightened out and a horizontal extension used on a Bradford frame. The *x*-rays (Figs. 773, 774) show that the fragments did not clear and did not touch; vertical extension was substituted, but still no reduction. Manipulation, under the fluoroscope, under full anesthesia, failed to reduce the fracture and did not produce crepitus, proving that there was muscle interposition. Open operation showed muscle firmly snagged over the bone end. A small intramedullary splint of oxbone was inserted and the limb put in a plaster cast (Fig. 775). The third day the patient had a high temperature, and, fearing infection, I cut a window in the cast. Also, the cast became moistened with urine. There

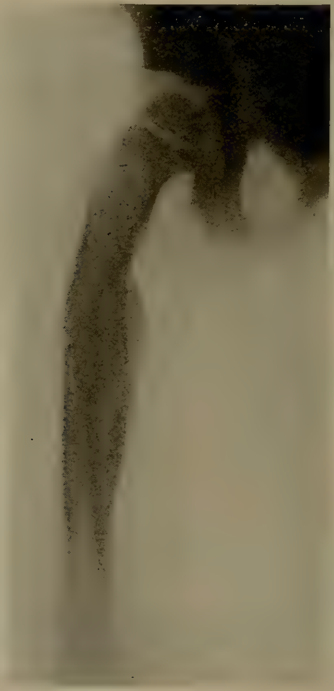

Fig. 777.

proved to be no infection of the thigh, but there was a colon bacillus pyelitis. With the weakening of the cast by cutting the window and the partial softening by being moistened, external fixation was inadequate. At once the intramedullary splint broke and the ends of the bone began to side slip and angle (Fig. 776). The cast was not removed, but straightened out, and more splinting and plaster applied. External fixation was restored just barely in time and the functional result was perfect, as shown in Fig. 777.

CLINIC OF DR. NELSE F. OCKERBLAD

Bell Memorial Hospital, University of Kansas
School of Medicine

EARLY PAPILLOMA OF THE KIDNEY PELVIS

Hematuria is frequently a sign of tremendous importance to the patient. We are presenting today a patient who has had hematuria continuously for two years. We have had him under observation for little over a year in the Out-patient Urological Department. He states that there never has been a time in the past two years that his urine has not been bloody. There has been no pain either over the kidney region or referable to the bladder or urethra. There has been no dysuria or frequency. The one outstanding symptom is hematuria. The patient insists that the onset of this hematuria was two years ago following a strain of his back after lifting a piano. He says that blood in the urine was noticed for the first time the next morning. This patient could easily be classed as a case of essential hematuria and put on palliative treatment in the hope that the hemorrhage would clear up. The term "essential hematuria" means that we do not know the cause of the bleeding. It should mean, further, that it is most essential to find out why the patient has blood in his urine. About 80 per cent. of all cases of hematuria come under three heads, namely, stone, tuberculosis, tumor. From this one can readily see the gravity of hematuria and the urgent necessity for exhausting every means of diagnosis at hand in order to discover the basic cause. We are certain that this patient bleeds only from his left kidney. We have repeatedly cystoscoped him during the past year and the blood has always been found spurting out of the left ureter. A complete urologic examination has been done since the patient has been admitted to this hospital, summary of which is about as follows:

There is no obstruction in the ureter or prostate to a No. 24 cystoscope. The bladder capacity is about 6 ounces. Several ounces of chocolate colored bloody urine was washed out of the bladder, and when the bladder was filled with clear media blood could be seen spurting from the left ureter. This ureteral os was readily catheterized and the catheter passed to the kidney without obstruction. Bloody urine was obtained from this left catheter. The right ureter was seen normally placed on the trigone and was

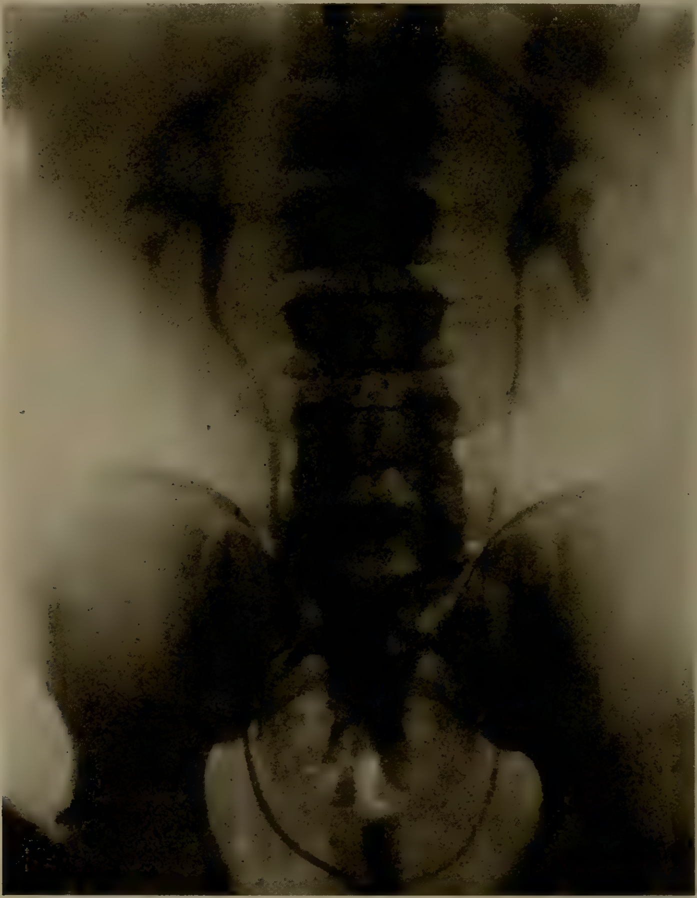

Fig. 778.—Pyelograms showing a double pelvis on the left with slightly blurred outlines.

seen to spurt freely and normally, and was catheterized easily, the catheter passing up the ureter about 10 cm., but it would go no further. The urine from this right side was clear. The appearance time of the phenolsulphonephthalein was four minutes on either side. The right side put out $12\frac{1}{2}$ per cent. of the dye in twenty minutes. The left side, only about 2 per cent. Blood and pus were found in the specimen from the left. The right shows no pathologic findings. The importance of continuous bleeding cannot be overstressed. It is suggestive of kidney tumor, but stone as well as tuberculosis can do the same thing. Pyelograms were made. A study of these plates does not help very much in a positive way. On the right we have a normal pelvic outline. On the left there is a double pelvis. The outline is somewhat blurred, probably from movements of the diaphragm, and neither ureter is dilated. From these pyelograms one could rule out tumor, as there is no rotation of the kidney and no distortion of the pelvis. As for a diagnosis, we are no nearer now than before. We have only these facts. We know this patient passes blood in the urine constantly and has done so for two years. We know it comes from the left kidney. We are sure the right kidney is a good functionating organ. We have ruled out stone, and although we find no acid-fast bacilli, we have not as yet positively ruled out tuberculosis. It is doubtful, however, if this is tuberculosis. The clinical picture is not right. Tuberculosis seldom causes continuous, uninterrupted bleeding.

Kidney surgery today is very much improved over what it was twenty years ago, but there are many unsolved problems. It would seem to be equally bad to not do enough as it is to do too much. The problem as to when to do a nephrectomy and when to temporize is not at all an easy one. In this case we are going to cut down on this kidney, believing that any patient who has had continuous bleeding observed over such a period of time is entitled to the benefit of having his kidney examined in an exploratory way. The patient has now been anesthetized and has been placed on the table with his right side down exposing the left loin and kidney region. A curved lumbar incision is made starting at the tip of the twelfth rib, curving forward and downward to the level of the anterior superior spine. As we cut through the muscle layer we see the yellow fascia of Zuckerkandl exposed. This is cut through with the scissors and the hand introduced into the wound; the wound is now enlarged above and below with scissors, and the kidney is searched for. The kidney is found lying high up under the diaphragm. We find that it has some adhesions about it. After stripping these off it is evident we are dealing with a kidney with a short pedicle. It is rather difficult to deliver this kidney into the wound. The kidney itself appears like a fairly normal one. There is no evidence of pus, no palpable masses, except along the ureter. In palpating the ureter we find that there is a suspicious nodular substance present. On account of this history of bleeding and the suggestion that this might be malignant we will do a nephrectomy.

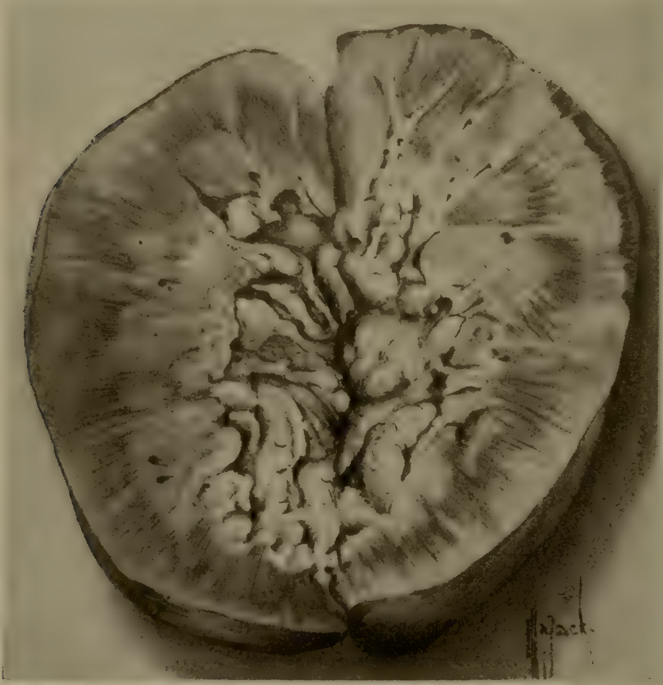

Fig. 779.—Cut section of the kidney showing the papillary growth in the pelvis and also the double pelvis.

The ureter is stripped and palpated as far down as possible. We are cutting the ureter well below the masses that have been felt through it. The clamp is now applied to the vessels and the kidney cut loose. The kidney vessels are tied, each one separately, and the wound is closed layer by layer without drainage. The patient is being taken from the operating-room and is in good condition. We will now turn our attention to the specimen we have just removed. We will first open this piece of ureter we have and see what it contains. There is a small deep red tumor-like mass in the mucosa of the ureter and numerous purplish-red patches are present in the kidney pelvis as well. Undoubtedly it is this that has been causing this man's bleeding. We are probably dealing with a very early papilloma of the kidney pelvis. We shall await with interest the report of the pathologist as to his microscopic findings.

Progress of the Case, Discussion, and Pathologic Report.—Following is a copy of the pathologic report by Dr. Wahl, Pathologist at the University of Kansas School of Medicine: "The specimen consists of a section of the ureter which is open and measures 3 cm. in length by 1 cm. in width. The mucosa is considerably thickened and there is some submucous hemorrhage. There is no hemorrhage on the surface. In addition, there seems to be a small, soft, hemorrhagic, flattened, warty, tumor-like elevation at one side measuring about 5 mm. in diameter. There is no ulceration on the surface. The kidney measures 10 by 6 by 3½ cm., and weighs 110 grams. It is of normal consistency. The capsule strips off with a little difficulty. The cortex has rather a pale brown color, showing small pin-point hemorrhages in the substance of the cortex. There is also some congestion of the cortical vessels. The section cuts readily and the cortex measures from 7 to 9 mm. in thickness. The pyramids are about twice as thick as the cortex. There is a considerable amount of peripelvic fat. On opening the pelvis it is found to be divided into two distinct portions. One portion goes to the upper pole of the kidney and the other to the lower portion. And the wall of the mucosa is considerably thickened. There is abundant hemorrhage just underneath the epithelial lining. In some places there seem to be slight, somewhat congested, wart-like elevations, protruding above the surface, giving a somewhat velvety appearance. There is also considerable congestion and hemorrhage in the tissue immediately about the pelvis. A few pin-point hemorrhages could be seen in the pyramids. These, however, were not very striking, being in more indirect contact with the calices and the mucous membrane about the calix. In the medulla at one side there is an opaque white nodule measuring 3 to 4 mm. in diameter, suggesting a cellular fibroma.

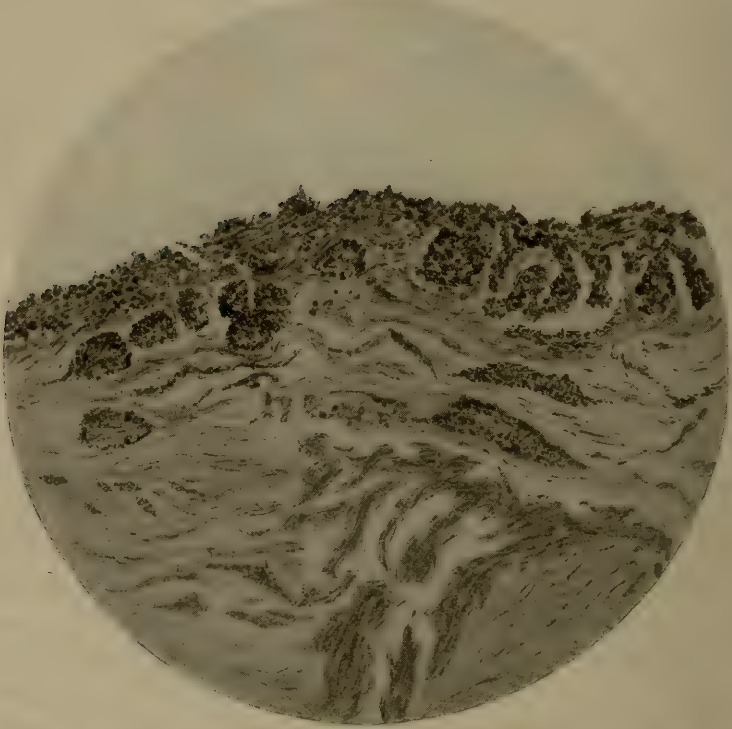

Fig. 780.—Drawing from microscopic section showing the papilloma described in the pathologic report.

"**Histologic Pathology.**—One of the sections taken through the ureter shows some hyperplasia of the epithelial cells in the mucosa, and underneath this layer of the mucosa there is a considerable area of hemorrhage. The walls, submucosa, and muscularis of the ureter are also considerably thickened and show irregular foci of lymphoid and small mononuclear leukocytes. In addition, along the outer portion there is more or less extensive diffuse hemorrhages. The mucosa is in several places more or less completely desquamated. In some places the leukocytes tend to cluster about small dilated capillaries. Many of the capillaries are filled with hyaline thrombi. Thrombi are also present in some of the smaller veins both in the submucosa and throughout the walls of the ureters. In some of these small veins the thrombi show beginning organization. In another section there is a peculiar type of proliferation of the epithelial cells, these cells projecting down into the underlying tissue in the form of solid balls of polygonal or rounded cells, which are fairly well circumscribed from the surrounding tissue. The basement membrane seems to be absent in some places. The cells are, as a whole, uniform in appearance, though there is some irregularity. The picture somewhat suggests a beginning malignancy of a flattened papilloma of the ureter. These epithelial masses are rather diffuse along the entire section in one of the slides. In this location there is considerable ulceration of the mucosa and the same chronic inflammatory tissue throughout the wall of the ureter already noted.

"The kidney shows very marked cloudy swelling effecting the convoluted tubules. In some places the lumina of the tubules are entirely occluded by swollen cells. In other places the inner portion of the swollen cells are more or less disintegrated. The glomeruli are swollen. There are a great many more nuclei in the glomeruli tufts than is usual. The endothelial cells also appear to be swollen, and there are relatively few red blood-cells in the capillaries. Most of the capillary lumina seem to be obliterated. The intestitial tissue shows a few patches of slight increase in fibrous tissue; this however, is not marked. There is some congestion of the vessels, and in some places distention of the lymph vessels. The stroma in the medulla, particularly near the pyramids, show a peculiar myxomatous type of change with considerable edema intervening. The tissue around the pelvis shows marked congestion and considerable diffuse hemorrhage resembling a picture which is very similar to the ureter. The epithelial changes are also, as a whole, similar to that noted in the ureter. What are apparently hyaline casts are found in many of the collecting tubules. At one corner of the kidney in the section of the medulla there is a nodule composed of interlacing bundles of young connecting tissue, in other words, a small fibroma. There are some lymphatics which are enormously distended with a homogeneous, eosin-staining material. Fibrous tissue changes may be seen in some of the glomeruli, particularly in those areas where there is considerable increase in the fibrous tissue of the stroma."

Diagnosis.—Papilloma of the ureter and pelvis (multiple), chronic hemorrhagic ureteritis and pyelitis, also chronic tubular nephritis.

This patient made an excellent recovery, wound healed by primary union, and the patient left the hospital on the eighth day after the operation. He has returned to work and has been in perfect health ever since. We believe that in this case we happened upon a very early papilloma of the kidney pelvis. From the pathologic report we can see that we are dealing with a papilloma with a malignant tendency, if, indeed, there are any that do not have a malignant tendency. Needless to say, this is an extremely rare case. Authors who have searched the literature and collected cases, report prior to this case 56 cases of papilloma of the kidney pelvis. From the description of these other cases this case herewith presented is by far the earliest case of papilloma of the kidney pelvis that has yet been reported. These capillary tumors of the kidney pelvis are quite unlike the adenomatous papillomas which sometimes grow in the substance of the kidney. Ordinarily these tumors of the kidney pelvis do not infiltrate the kidney substance, but tend to pass down the ureter. The etiology of these papillomas of the kidney pelvis is not any clearer than the etiology of papillomas anywhere. However, in this case we do not know whether there has been a chronic low-grade infection in this kidney pelvis and if this continued irritation tended to give rise to a papilloma. We are satisfied that in this case we have done the right thing for this patient. We are also satisfied that this papilloma was confined to the kidney pelvis and the upper portion of the ureter. The removal of this kidney undoubtedly cured this man. Had this been permitted to go on, it certainly would have escaped from the bounds which held it and gotten into the bladder or extended through the ureter and attack other organs. It is not infrequently observed that these papillomata, which certainly resemble bladder papillomata, may suddenly change their character and become very malignant. They may have early metastasis after having changed their form. This is a very fortunate case. It is one of those cases where the surgeon feels satisfied that radical measures were justified. On the other hand, had we removed this kidney for hematuria and found no pathology, we would have felt that we had made a mistake and had not done the fair thing by the patient. So we see the problems in kidney surgery are not at all simple. Many times judgment must be given at the time of operation. If the surgeon is wrong either way the patient may suffer and may even pay for the mistake with his life.

PARAFFIN FOREIGN BODY IN THE BLADDER WITH CALCULOUS FORMATION

We have for operation today a patient who has complained of painful and frequent urination for the past four months. He is, as you see, a white male. He gives his age as fifty-nine years. He has a frequency of every fifteen minutes, with strangury. The frequency is about as bad at night as it is in the daytime. He has noticed blood-stained urine at times. Frequent and painful urination is pathognomonic of no particular disease of the urinary tract, but is common to a vast variety of such maladies.

An attempt was made to cystoscope this patient before he was sent to this hospital, but this was apparently not successful, as no pathology was discovered. The patient was cystoscoped yesterday. The urethra admitted a No. 24 French cystoscope without difficulty, there being no obstructions in the urethra or prostate. There was no residual urine. The bladder capacity was 100 c.c. The patient complained bitterly of pain on dilating the bladder with fluid. There was no prostatic collar, and there was no enlargement of the prostatic gland to rectal palpation. Reposing in the most dependent portion of the bladder (the patient in a prone position on his back) was seen a rough calculus of moderate size. The ureters were seen normally placed, the openings being greatly dilated. The mucous membrane throughout was greatly inflamed and was rolled up into great velvety ridges.

Following the cystoscopy the patient was taken to the *x*-ray room, where the bladder was filled with 15 per cent. sodium bromid solution; 110 c.c. of sodium bromid solution was introduced. The patient complained of a great deal of pain from this dilatation of the bladder. Before the sodium bromid was introduced, however, a plate was taken. Sodium bromid plates were made in stereo. A study of the *x*-ray plates which we have here reveals to us a calculus which is not as dense as one would have believed from the cystoscopic picture and which casts only a faint shadow; however, it is well defined. There are no pouches or diverticula seen in the stereo plates of the injected bladder. The striking feature about this roentgenogram is that the dilated ureters have permitted the opaque media to mount up to the kidney pelves on either side and outlining them well. You will note that the ureters are both dilated.

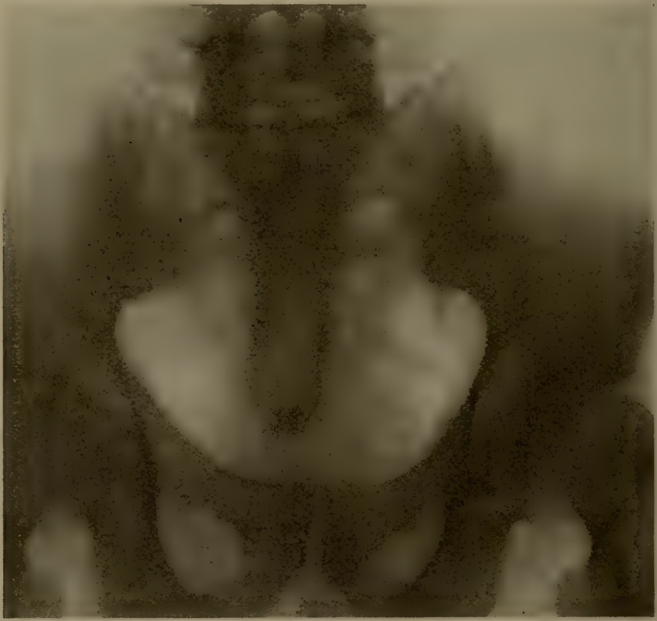

Fig. 781.—*x*-Ray of the bladder showing the calculus.

From the foregoing discussion it can be seen that we have made a diagnosis of calculus in the bladder and that we are about to do a suprapubic lithotomy. The question of operability of this patient arises. We must ask ourselves whether or not the patient is a good surgical risk. We have here before us a rather thin, poorly nourished patient of about the stated age. The physical examination is essentially negative. The urine contains a trace of albumin, it is acid, and the specific gravity is 1.020. It also contains on microscopic examination red blood-cells and many pus-cells. There are no casts present. The blood-pressure is 130 systolic, 86 diastolic. The red blood-count is 4,840,000, with 85 per cent. hemoglobin, 11,000 white blood-cells, 70 per cent. polys., coagulation time is two minutes. In addition to this he has a blood urea of 18 milligrams per 100 c.c.; phenolsulphonephthalein output was 40 per cent. for the first hour.

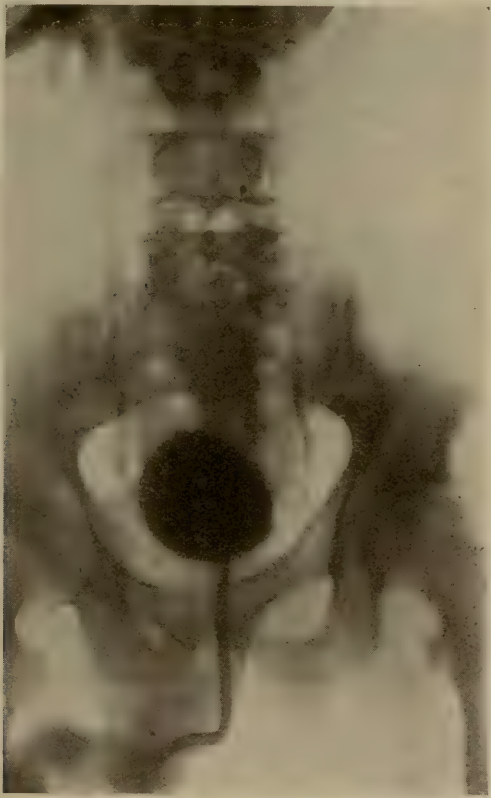

Fig. 782.—Cystogram in which the sodium bromid solution has mounted up the dilated ureters and outlined the kidney pelves.

A patient with the above findings should be a fair surgical risk for the operation which we are about to do. Were it not for the fact that he is an extremely irritable, nervous type of a person, who apparently is unable to control himself by his own volition, we would perform this operation under local anesthesia. However, in this case we prefer gas anesthesia. The patient now having been anesthetized, we will proceed at once to open the bladder. Our assistant has placed the catheter in the urethra and is washing out the bladder with sterile water. The incision is now made in the midline just above the symphysis pubis, upward toward the umbilicus about 8 cm., cutting through the skin and fascia and exposing the rectus muscle. This sheath is incised, the muscle turned aside, and we are down to the bladder coverings. Our assistant now fills the bladder with fluid and the bladder mounts up into the wound. We strip the peritoneal reflexion and expose the bladder, which we identify by its tortuous veins. We are dealing with a small contracted inflammatory bladder. We now seize the bladder by two stay sutures which we have placed and make an incision between them. The fluid with which the bladder has been filled pours out, and three foreign bodies have floated out which we will put aside for further examination. Sweeping our fingers around the bladder we discover no pouches or diverticula; however, the ureters are very much dilated and will admit the tip of the index-finger. We feel a calculus in the dependent portion of the bladder. This is in the shape of several fragments. These we are removing. All the fragments of the calculus being removed, we will proceed with the closure. The tube is now secured in the bladder by purse-

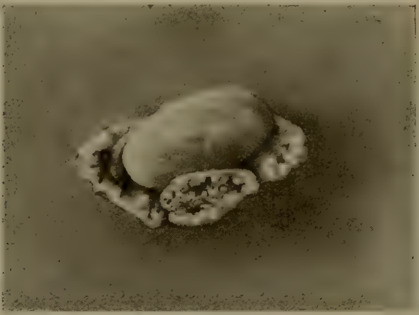

Fig. 783.—The paraffin body which fits perfectly in a fragment of the calculus that had formed about it.

string sutures, and a cigarette drain is placed in the space of Retzius and the wound closed layer by layer. The anesthetist reports that the patient is in good condition, is already awake, in fact, and is ready to be taken from the operating-room.

Let us now turn our attention to these peculiar bodies which floated out of this bladder. The fact that they floated out indicated they were much lighter than the water with which we filled the bladder. One can readily see that they are composed of some waxy substance, probably paraffin. The fragments of the calculus have the appearance of a shell which, in fact, it is, as they can be fitted over the largest of the three pieces of paraffin. We must now alter our diagnosis to include "foreign body in the bladder." The paraffin evidently acted as a nucleus or a foreign body and the phosphatic deposits were laid down upon it. This is a very unusual condition. Paraffin ordinarily does not act in such a manner. It is difficult to see how urinary salts would stick to a waxy surface like paraffin. There have been several cases of paraffin foreign body in the bladder reported in the literature. The problem of how these paraffin lumps get into the bladder is not always easy of solution, and certain facts which the patient may have will be necessary before we have the answer. Paraffin is absolutely foreign to the human economy. It must be introduced from the outside. Cases have been recorded in which paraffin has been found in the bladder having been introduced by an attempt to cure a hernia by injection of this substance. Paraffin has also been introduced into the urethra by persons with perverted sexual tastes. Dr. Ernest G. Mark recently told me about a case of his in which he twice removed paraffin bodies from the same bladder, although the patient denied any knowledge of how these bits of paraffin were introduced.

Discussion of the Progress and Outcome.—The patient was rather unruly and of a very nervous and restless type, and some time during the first night after the operation pulled the tube out of his bladder. However, he made good progress until about the fourth operative day, when his temperature began to rise. At this point we obtained some very interesting history which threw light upon how this paraffin got into the bladder. The patient stated that he had been an alcoholic for years, and that just about a year ago he and some friends of his had a drinking party which lasted about a week. When he began to sober up from this he noticed an intense burning in his urethra. This brought to his mind the relief he obtained some eighteen years before from some soluble bougies which were introduced into his urethra for a urethritis he had at the time. He had been taking treatment from some advertising doctor. He stated that for many years he kept these soluble medicated bougies on hand, and occasionally used one. Not having any of these bougies at the time, he proceeded to make some by cutting long strips from a paraffin candle. These he made cylindric by rolling them between the palms of his hands and introduced two or three of these into the urethra. He was fortunate in the selection of the paraffin, as it evidently had a low melting-point and slipped readily into the bladder. This very interesting bit of history confirms our notion that when paraffin is found in the bladder it must always have been introduced from the outside.

As soon as the patient's temperature began to rise we again checked his blood chemistry, and found that his blood urea had risen to 96.67 and the blood chlorids had fallen to 380; creatinin was 1.8. He gradually became more toxic and died in coma on the seventeenth day after operation. An autopsy was obtained and a summary of the report by Dr. Wahl follows:

"The lungs showed evidence of metastatic pyogenic infection with areas of healed tuberculosis and large healed caseous nodules together with bronchopneumonia. Both kidneys were enlarged and the perirenal capsules found to be adherent and to contain a small amount of pus. Numerous small abscesses measuring from 1 to 3 mm. were found on the surface of the kidney and extending into the cortex. There was no evidence of a chronic nephritis. The ureters were distended, but soft and not infiltrated. There was found a large abscess at the base of the bladder with a marked pericystitis."

The anatomic diagnosis as given by Dr. Wahl reads:

"Acute and chronic hemorrhagic and diphtheric cystitis, perivesical abscess, suppurative nephritis with embolic abscesses of the lung, bronchopneumonia, parenchymatous degeneration of the heart, liver, and kidneys, edema of the lungs, chronic nephritis, atrophy of the spleen, chronic pleurisy with adhesions, anthracosis, fibroid nodule, purulent bronchitis."

Summary of the Discussion.—This case is a very interesting one from several viewpoints. In the first place, we operated on a man with resistance greatly lowered from chronic alcoholism. Again, we have a patient who had a very severe grade of cystitis; much more severe than we had believed at the time of operation. Owing to the bladder condition the kidneys were not catheterized and checked separately, so we might have overlooked the possibility of an infection that should have been cleaned up in advance. It is usual for these cases to clear up at once as soon as the bladder is properly opened and drained. We have in the next place the condition as above stated, complicated by a foreign body in the bladder which had been incrusted with a phosphatic deposit, and further we had what should probably and properly be called a congenital dilatation of the ureters. Whenever ureteral openings are found large enough to admit the tip of the index-finger, the ureter not being diseased or the walls thickened by inflammatory process, one is almost forced to the conclusion that they have always been in this condition. We know that congenital malformations of the urinary tract are notoriously subject to infection. It is conceivable that in this case we might have had an ascending infection by direct extension up the mucosa. However, we need no such explanation to account for the end-result. Undoubtedly there was a pericystitis with abscess formation, the organisms from the abscess being carried to all the organs of the body, and death resulted rather from generalized septicemia than from kidney failure.

CLINIC OF DR. ELMER D. TWYMAN

Christian Church Hospital

RAYNAUD'S DISEASE; TROPHIC ULCER; PERIARTERIAL SYMPATHECTOMY

The case to be presented is a man, age thirty-three, complaining of a chronic painful ulcer of the left great toe. See also the color changes in all the toes and the fingers (Fig. 784). All the extremities are both subjectively and objectively cold. His feet and toes are painful, excruciatingly so when chilled. There has never been actual frost-bite.

This tendency to cyanosis and pain and coldness in the extremities has been present for three years, and has been variously diagnosed. Three years ago he was treated for rheumatism, at a later time for weak arches; also for chilblains; for osteomyelitis, and for syphilis. He has had four negative Wassermann reactions. His teeth and tonsils and sinuses have been investigated without result. The ulcer on the toe appeared six months ago following a small scratch, and has been operated on twice without improvement. You note that there is no inflammatory zone and no granulations. The edge is crater-like, *i. e.*, a trophic ulcer.

Examination.—Family and personal history negative. General condition good. Hemoglobin, 85 per cent.; reds, 4,200,000; whites, 8200.

Urine negative.

Blood-pressure.—Left arm, 132/74; right arm, 118/74; left leg, 164/110; right leg, 160/98 (popliteal).

Blood-sugar, 100 mg. to 100 c.c.

Allergy tests, by Dr. W. W. Duke, response to fruits and bacteria, no majors developed by retest.

Locally.—We see the ulcer described, the nails are clubbed, the extremities cold, painful, and cyanotic. Pressure on the cyanosed area gives a dead white, returning to the previous color by very slow degrees from the periphery. Elevation modifies the cyanosis slowly but not completely and dependency exaggerates it.

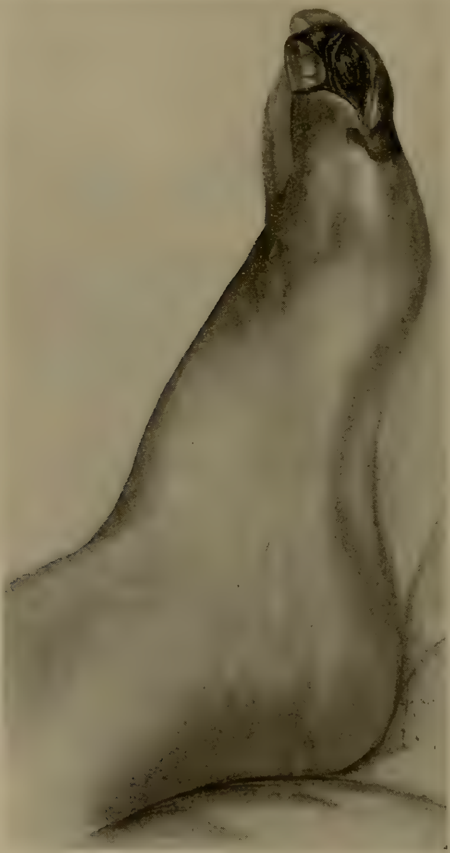

Fig. 784.—Raynaud's disease; trophic ulcer; periarterial sympathectomy.

Diagnosis.—Raynaud's disease, with trophic ulcer.

Operation Proposed.—A LeRiche periarterial sympathectomy on the femoral arteries.

This operation is "on trial," and has had some success in this condition and others which are assumed to be caused by arterial spasm or other disturbances due to involvement of the periarterial sympathetic nerve-fibers.[1]

Other conditions mentioned by LeRiche for trial are: causalgia, painful stumps, posttraumatic contractures, and edemas, ischemic sequels and tropho-edemas, trophic sloughs, varicose eczemas, scleroderma, and sclerodactylia, alopecia, etc. The operation has been practised in Kansas City by Binnie and by Owens. The latter reported cases to the Kansas City Academy of Medicine last year. Time will show whether previous claims are too broad. Also whether the previous assumption is correct, *i. e.*, that the principal vasoconstrictor sympathetic nerve-fibers, if not all, run in the sheath and adventitia coat of the principal artery and whether fibers cross lower down from the posterior tibial nerve, at the malleolus or lower; requiring section or injection there for cure.

Operation.—My 7-inch incision over the course of the main superficial femoral lies partly in Scarpa's triangle and partly over the course of the vessel in the upper part of Hunter's canal. Division of the deep fascia and retraction of the sartorius muscle outward exposes the vessel pocket, the artery lying external and later anterior to the vein. There are few branches—the sheath is adherent and the adventitia coat more vascular and adherent than normal. This appearance might even justify the idea of a mild inflammatory reaction. I am now lifting and separating the vessel. Its filmy delicate outer coat is grasped with forceps and incised longitudinally. See that we have at once the primary contraction of the vessel to one-half of its former size and practical disappearance of pulsation as described by LeRiche. The nurse says, however, that the feet still feel warm. I now separate this coat around the circumference of the vessel—the complete denudation being about 5 inches. Shreds are removed by gauze. The vessel is now quite small over the exposed portion. The field is dry.

Closure.—I replace the vessel in its bed and draw over the sartorius and the deep fascia with catgut, and metal clip the skin. The condition being good, we will operate the other side also. Here we do not find the same degree of vascularity and adherence, and the separation of the adventitia is much easier. This procedure is supposed to give a tolerably permanent block to vasoconstrictor sympathetic impulses. After primary constriction due to the irritation, which we see now has subsided (about six hours), there is supposed to follow a period of vascular dilatation due to interruption of sympathetic vasoconstrictor impulses. His cold feet should be quite warm tomorrow.

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[1] Rene LeRiche, Some Researches on Periarterial Sympathectomy, Annals of Surgery, vol. 74, p. 385.

I complete closure in the same way as before. Anesthetist reports condition of the patient is good.

Follow-up: Next day patient reports that the feet feel quite warm and comfortable. No pain in the feet or wounds. Skin of the feet appear flushed, reddish rather than cyanotic. He has a tingling sensation on the inner side of the left thigh due to injury of a cutaneous nerve.

One week later patient up in wheel chair. Wounds healed *per primam*. No pain since operation. Feet continue warm. Base of the ulcer shows some granulations and appearance of life.

Two weeks later patient discharged. Granulations in the ulcer more advanced, and some skin proliferation from the edge can be noted.

Final blood-pressure taken on 4/8/22: Left arm, 108/74; right arm, 98/74; left leg, 140/100; right leg, 134/98 (popliteal).

VARICOSE VEINS AND ULCERS. INOPERABLE. REMARKS ON THE ANATOMY

This patient (Fig. 785) presents an illustration of unusually developed collateral venous circulation in compensation of obstruction of the deep veins by a bilateral septic thrombotic condition which she suffered twenty years ago following childbirth. There has been such a complete obstruction of the deep femoral and perhaps even of the iliacs that nearly all the blood from the legs returns through the superficial veins. A visible

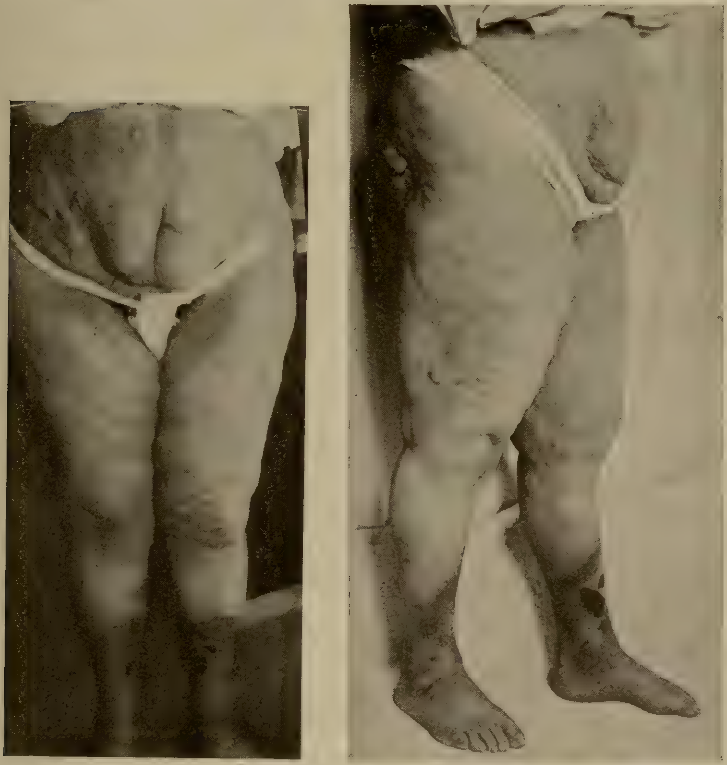
Fig. 785.—Photographs showing collateral venous circulation.

pelvic girdle of collateral circulation has resulted. We see the massive dilatation of the gluteal, superficial circumflex iliac, and superficial epigastric veins, besides the saphenous system. This patient has to spend most of her time sitting on the floor, as even the dependent position of sitting causes pain and bad effects on her leg ulcers. I consider operation of any sort to be contraindicated and have so advised her physician, Dr. Messenger. Dr. Hertzler concurs in this opinion.

The classical Trendelenberg test (descending reflux) is very positive, and superficial constriction produces a cyanosis of the limb. The ascending reflux (timed constriction test of Homans, of Boston) is also positive. This test is not so well known. Homans[1] says, "In varicosity of the surface veins alone filling below the constriction takes place in three-quarters of a minute or more, and even then these vessels may not be tense, for the perforating veins are continually carrying off the excess of blood. If, on the other hand, the perforating veins are incompetent, the surface vessels below the obstruction will fill possibly in ten, twenty, or thirty seconds, according to the importance of the leak. These two tests serve to separate the pure surface varicosities from those which also have varicosity of the perforating veins."

I do not find myself able to agree with Homans as to the significance of this test, principally because I am convinced that the anatomy is not as commonly described, and as believed by Homans. After reading Homans' articles in 1917 I read again the anatomies available to me. I found that Spalteholtz is clearly of the same opinion as Homans, *i. e.*, that blood flows from the superficial system to the deep system of veins in the leg, and must perforce do so because the valves in the perforating veins force it to do so unless "the perforating veins are also dilated and varicose and the valves incompetent" (Homans). Gray, Cunningham, Piersol, Swabota, Murrich, and Told failed to cover the point very definitely. Terrier and Alglave, Rev. de Chir., June, 1906, agree with Homans. This did not satisfy me for reasons

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[1] Etiology and Treatment of Leg Ulcers, Surg., Gynec., and Obst., vol. 24, 1917.

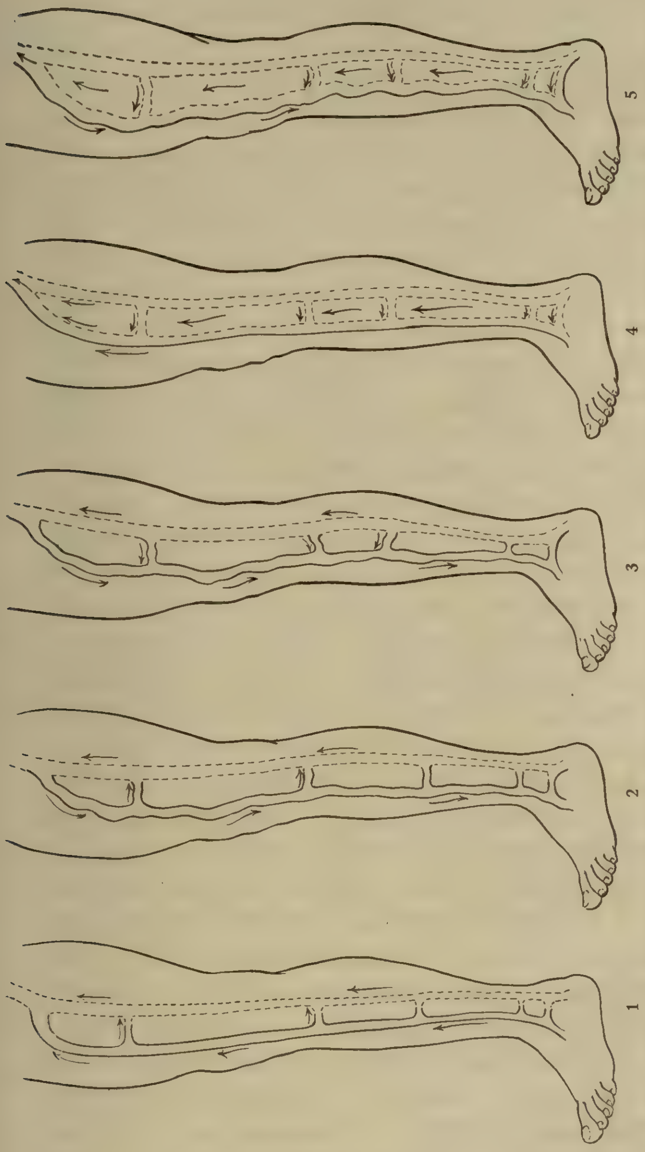

Fig. 786.—1. Diagram of normal anatomy (Homans: Surgery, Gynecology, and Obstetrics, vol. 24, p. 300, 1917). Arrows show the direction of flow of venous blood.

2. Simple surface varicosity (Homans). Arrows show reversed flow in the saphenous vein.

3. Superficial complicated by perforating vein varicosity (Homans). Arrows show reversed circulation in these veins also.

4. Diagram of the normal anatomy, Twyman's view. Arrows show perforating veins acting as spillway during muscular action.

5. Condition due to varicosity of the saphenous system. Arrows show blood flowing from the deep veins through the communicating veins meeting the blood returning from the saphenous reversed flow. Result, stasis.

I will give presently, and I was pleased to receive confirmation from Dr. Ranson, of Northwestern University, also from Dr. Cowgill, of Kansas University. At my request both had dissections made to establish the point, and both found that the valves in the perforating veins, from two to four in number, are so placed that blood flows from the deep system of veins in the leg to the superficial or saphenous system. Neither would say that they were sure that all the existing communicating veins had been found or that some of them might not be free of any valves, but all those found were equipped as I have stated. I had theorized that the superficial veins should act as an emergency spillway for the blood from the leg during muscular action, and that the valves should be arranged to provide for this action; otherwise, nature would have provided valves to act contrariwise till the need arose for a spillway, and then they must temporarily and providentially become incompetent. This seemed absurd. It seemed equally absurd to suppose that nature had anticipated and provided for the condition arising from the man-made and recent garter by arranging valves in the way described by Homans, but had not provided for the condition arising during muscular action, and I also predicated that muscular spasm or tetany, ordinarily known as leg cramps or swimmers' cramps, should be found to be a factor in the production of varicose veins. Since 1919, when I originally reported this theory to the Jackson County Medical Society, I have demonstrated it several times in the history of such patients. At the time of such a cramp the rigid fascial tube allows the tetanic muscle to compress the deep veins completely at some point, and the saphenous system is forced to carry all the blood from the leg for a long period. This prolonged strain exceeds the limits of elasticity and recovery, and permanent dilatation with varicosity results. The same thing has happened in the case before you, although in this case the obstruction to the deep veins is organic and irreparable, and destruction of the saphenous system by operation might result in a gangrene of the leg. There are, of course, other and well demonstrated points in the etiology of varicose veins. For treatment of this case we can only recommend physiotherapy and some form of elastic surface support.

PARTIAL VOLVULUS OF THE CECUM

This farmer boy, age twenty, complains of pain and tenderness in his right side, with constipation and gas-pains, and a sensation of dragging and pulling in the right flank when he turns on his right side. This will be his third operation for relief of this complaint.

I am presenting this case because it will illustrate one or another of the very diverse conditions of right abdominal pathology underlying the large number of cases who say "I had my appendix removed, but I still have pain." If one can truly evaluate the pathology, relief can usually be given. We will proceed with the specific instance, as the general problem has too extensive a literature to cover in a brief talk.

History and Examination.—Since he can remember he has had trouble as described in his right side. In his eighteenth year he had a severe attack diagnosed as appendicitis. The appendix was removed through a right rectus incision. We see the neatly healed 4-inch scar on the abdomen. The acute pain was relieved, but the old, dull, pulling, wide-spread pain was not. In fact, he was more tender than ever. Six months later he was reoperated "for adhesions," and made a good recovery. But he was not relieved of his original complaint. He now felt himself unable to work, although of a stolid rather than a neurotic type of individual.

I examined him six months after the second operation, one year after the first, finding a well-healed scar, no mass, although intermittently bloated, no sign of a hernia, tenderness, and pain as described before. He was advised to temporize and rest and recuperate in the country. Two months later he returned—condition unchanged—but was advised now to await recovery from an acute intercurrent bronchitis. This accomplished, he now accepts operation on an exploratory basis.

Operation.—As might be expected, we find some omental adhesions to the well-healed inner sheath of the rectus. There are also some adhesions of the caput coli to the parietes and to the omentum. These we separate. The amputation site of the appendix is smooth and adhesion free. The cecum is a mobile type. It is twisted clockwise on its own axis—partial volvulus—thus throwing the illeocecal valve posteriorly. As you can see, a twist is produced in the ascending colon near the hepatic flexure. This narrows the lumen and causes a back pressure in the cecum. We see that the cecum is dilated and baggy. See the parieto-colic-hyperfixation band high up on the ascending colon. The clockwise twist of the cecum on its axis would probably not be obstructive in this case if this pivitol band did not prevent the ascending colon from following. As it is, you see, the twist (illustrating) draws this band down tight like a strangler's noose.

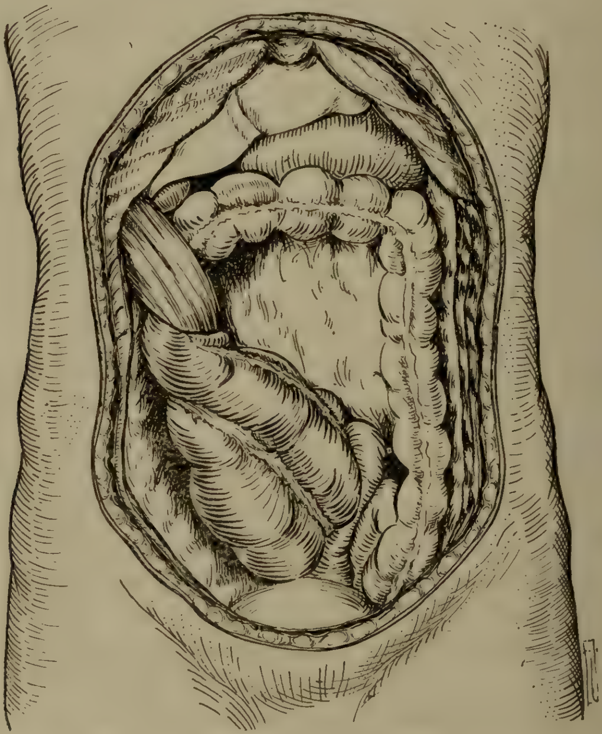

Fig. 787.—Partial volvulus of the cecum.

As I divide this band the colon expands from underneath. In order to balance the hang of the colonic drapery I will fix the cecum to the parietes with some stitches. This was Wilms' idea. It seems practicable. It produces balanced tensions. The denuded area above is too large to be covered well by closing the longitudinal cut in the transverse direction, so I will interpose a corner of omentum. As I find nothing else abnormal after inspection, we have probably remedied the pathology causing the symptoms in this case. Time will tell. We will make the usual closure.

Discussion.—This is by no means an extreme illustration of volvulus of the cecum. I am reporting 3 cases of absolute obstruction due to volvulus of the right colon which will be published in the Transactions of the Western Surgical Society next year. Homans reported 3 in the Archives of Surgery last year. Wilms has written extensively on it. Many others accept it. Treves classified the cases into three groups in 1899; yet there are many disbelievers in the idea. Some operators would emphasize the importance of the parieto-colic-hyperfixation band which we found here. I think the twist the more important factor, since the band would not be obstructive without the twist. However, one must try to produce balance. Lack of support above will allow the formation of a secondary loop and volvulus of the second type of Treves. I feel that I must accept complete volvulus of the right colon, since I have seen the cases, unmistakable and plain; and I feel that I must also accept partial volvulus as a clinical entity, since "the greater proposition contains the lesser."

Follow-up.—As soon as the postoperative tenderness had subsided—*i. e.*, ten days—the patient was able to say that he had relief from the unpleasant sensations in his side.

Letters six weeks later, six months later, and one year and three months later say that relief has continued and that the patient believes himself cured.

CLINIC OF DR. C. C. NESSELRODE

St. Margaret's Hospital

THYROTOXICOSIS—GRAVES' DISEASE

In presenting our cases this morning we will present 2 goiter cases and a gall-bladder case that we think are of more than passing interest. The first case to be presented is Mrs. B., aged thirty-two years, white, and a housewife. Her present complaint is of an extreme tachycardia, extreme nervousness the cause of which is well known to her. She has herself observed that she has an exophthalmos, and that she also has a slight enlargement of her thyroid gland, and without ever having consulted a physician she did know that her symptoms were due to an exophthalmic goiter. She presented herself first at the office some two weeks ago and related the following history:

Early History.—Irrelevant to present complaint.

Personal History—Menstruated first at the age of twelve normally and regularly, married at the age of seventeen, first child born at the age of eighteen, this a boy now fourteen years of age, in good health and normal in all respects, no subsequent pregnancies. Eight years ago she had an abdominal operation, the exact nature of which she is not certain, but knows that something was done to the uterus. Her appendix was removed at the same time, and while under the same anesthetic she had her tonsils removed, and a perineal repair. She had a rather stormy convalescence, says her throat and mouth were much swollen, and she remembers the experience only to shudder about it. Two years following this operation she divorced her first husband, and one year later married again. No children have been born of this second marriage, although she continues to menstruate normally. Her present marital relationship is not a very happy one.

Present History.—Since her past operation experience of eight years ago she has noticed herself to be very nervous, cried easily, had but little endurance, and has observed that at times her pulse was quite rapid during the past year and a half. This nervousness has seemed to increase, and she has been conscious most all the time of a rapid, throbbing pulse. During this year and a half she has lost 8 to 12 pounds, and she has noticed a gradual enlargement of her neck about the thyroid area. She perspires very easily, particularly the palms of her hands, and this perspiration seems to bear no relationship to any effort on her part or the temperature of the room. For some months past she has had considerable difficulty in sleeping at night, has been very restless, and found it hard to content herself except when moving about. She has had a number of attacks of diarrhea; these appear to be uncontrollable and bear no relationship to her diet.

I think every one will agree that this is quite a typical history of a marked thyrotoxicosis.

Physical Examination.—Her physical examination reveals equally interesting things. She is rather anemic, rather poorly nourished, has a marked exophthalmos with a definite Stellwag and Van Groffe sign and diffuse enlargement of her thyroid, a definite pulsation throughout the thyroid gland. It might more accurately be described as a thrill. Her nerve reflexes are all exaggerated. She has a marked tremor of the hands. Her blood-pressure is 150 over 90. Her pulse-rate varies between 130 and 160. Her heart sounds are normal. Urine normal.

Laboratory Report.—Hemoglobin, 75 per cent.; leukocytes, 8300 with normal percentages; red cells, 4,100,000.

And now we come to some interesting laboratory work which has a more direct bearing upon this case. In the two weeks she has been under observation she has had three different metabolic rate estimations. The first one, made two weeks ago, shows a metabolic rate of 170, a few days later 165, and one two days ago 170 again. She has been in the hospital for the past eight days, during which time numerous attempts have been made to do a Goetsch test, all unsuccessful because of her extreme nervousness. When anyone comes near her with a hypodermic she becomes almost frantic, and it did not seem safe to insist on the test; however, during one of her early visits to the office we did secure a Goetsch. At that time she had a marked rise in her systolic pressure with a very marked fall in diastolic, and a slow return of each to the previous reading. We have not the time this morning to discuss at any length the question of blood chemistry, but this particular case is quite typical of the majority of our observations. There is present a marked acidosis, the sugar tolerance is reduced, and, consequently, the percentage of blood-sugar is increased, and there is a very definite disturbance in the nitrogen balance. Our observation up to this time will justify us in making the statement that the disturbance in these three things is to a very large percentage proportionate to the degree of toxicity.

A brief summary of this case before she is brought in: We have here a very typical case of hyperthyroidism, or, perhaps more accurately speaking, marked thyrotoxicosis. She has a very high metabolic rate and a very positive Goetsch test. Her metabolic rate has maintained a constant high level during the two and a half weeks she has been under observation, although during the past eight days she has been in the hospital and has been kept consistently in bed. She is, by all the standards we know, a very poor surgical risk. We approach this case with a very definite knowledge that if much is done in a surgical way that she will not withstand the shock of the operation, so what we contemplate doing this morning is only a ligation of her right superior thyroid. We quite agree with those who contend that in doing a ligation of the superior thyroid one does more than merely reduce the blood-supply, and that "the doing more" is probably an interference with the sympathetic nerve supply to the thyroid gland. We are ready and you may bring in the patient. This patient has been given gas-oxygen in the outside room, and it is our experience that one can do a ligation under gas-oxygen more quickly and with less surgical risk than under a local anesthesic. Our incision is approximately 1 inch in length, transverse, and just over the upper pole of the thyroid, usually it is on a line with the thyroid cartilage. The muscle-fibers are retracted. The sternocleidomastoid muscle is, of course, retracted outward, the upper pole of the thyroid uncovered, the superior thyroid identified, and a ligature passes around the vessel with a ligature carrier or an aneurysm needle. Before the ligature is tied we like to again survey the field and make sure that our vessel is within the ligature, and if so, we are then ready to tie the ligature. We pass also a second ligature and again tie, this time getting down close to the upper pole of the thyroid, and we do not care if a small amount of the upper pole is included in the ligature. We have tried cutting between the ligatures. We have not been able to find that it has any advantage, and we did have one unpleasant experience in that the vessel slipped out of the ligature, and we had a severe hemorrhage which was hard to control. Inasmuch as the patient was very toxic and time quite an element, it was a rather embarrassing experience and one that we do not care to have repeated. The wound is closed in the usual manner with catgut suture material and a collodion dressing applied. This procedure has taken but a few minutes' time, and the patient will be returned to bed in practically as good condition as she was when she came to the operating-room, but we feel perfectly certain that she will have considerable storm following this surgical interference. Every effort will be put forth to keep her quiet, to protect her from any nervousness or any excitement, alkalies will be given freely, and fluids crowded to the limit. Of course, we will use morphin to control any pain and to aid in controlling the excitement. And let me add this, that we use morphin straight, that is, no atropin, for it has been my experience in these toxic cases that atropin does not act well.

Before the next case is brought in, which is a thyroidectomy, I want to say just a few words concerning our conception of the determination of the surgical risk in these cases. We feel that a study of the metabolic rate and also of the reaction to Goetsch test enables us to form a much more comprehensive judgment concerning the amount of surgical interference that one can engage in. In other words, the metabolic rate gives us an estimation of the degree of toxicity, while the reaction of the patient to the Goetsch test gives us an estimation of the resistance of that patient to surgical insult. Again, it is not enough to know merely the metabolic rate, because then we know only the degree of toxicity, but if we add to the knowledge of the metabolic rate a study of the reaction of the patient to a Goetsch test, we know not only the degree of toxicity, but we know also how much the patient had been injured by this toxicity, and can form a judgment as to the amount of surgical trauma this patient can stand.

Stating the proposition in still another way, we know, given a case of hyperthyroidism, any surgical interference will increase the degree of toxicity which, if carried to a sufficient degree, will result in an exhaustion of the vasomotor tone, and this exhaustion of the vasomotor tone will result in death. If we had a means at our hand with which we can measure the distance from the point at which we find the patient to the point of vasomotor exhaustion, we will have determined the width of the safety zone in the confines of which it is safe to play. If this zone be wide, one can attempt more surgery, and in a case with a narrow safety zone one cannot attempt very much. It is a measurement of this safety zone that we feel is accomplished by the means of the Goetsch. If following the injection of 6 to 8 mm. of adrenalin there is an immediate marked drop in the diastolic blood-pressure and a slow return of the same to its former level, we feel that that patient has already very nearly reached the point of exhaustion of vasomotor tone, and we know from experience that that patient is a very poor surgical risk, and will stand only the very slightest of surgical insult. This patient whom we have just seen is just such a case, and if she is to be brought safely through to a cure she must have the benefit of the most painstaking care and study. And in spite of all this it will often strain one's best judgment to know when and how much to interfere.

TOXIC ADENOMA OF THYROID

The second case represents the other type of thyroid toxicity, namely, the toxic adenoma, seldom if ever producing exophthalmos, coming on in much older patients and patients who have had an irregular enlargement of the thyroid for many years. This patient, Mrs. Ella M., aged fifty-seven, and a housewife, was admitted to the hospital first some three months ago, at which time she was very nervous, had a pulse-rate of 140, a metabolic rate of 147 and a very positive Goetsch, and all of the symptoms that go with a marked thyrotoxicosis. Following a week's observation embracing all of the studies as detailed in the previous case, we did at the first sitting a ligation of her right superior thyroid, a week later a ligation of the left superior thyroid. She remained in the hospital a week or ten days following the last operation, and then went to her home. During the two and a half months she has been away from the hospital she has been reporting to our office regularly at least once every two weeks, at which time, we have taken basal rate readings, numerous Goetsch tests, and we have been watching her very steady improvement. Four days ago she had a basal rate of 124, a Goetsch test which shows but a slight drop in a diastolic pressure, with a quick recovery.

In the light of these studies we approach this case with a feeling of confidence. We feel quite sure that we will be able to remove all the thyroid gland we desire without undue haste and complete an adequate closure of the wound. Allow me to say here, however, that in order to do good surgical work in cases of hyperthyroidism one must have confidence in his anesthetist, and must be willing to take advice from the anesthetist, as to when to discontinue his operative procedure. We have sufficient confidence in our anesthetist that when he advises us that the patient's blood-pressure is falling, that the pulse-rate is rising, in other words, that there are signs of approaching vasomotor exhaustion, we accept his judgment and cease operating at once, returning the patient to bed, to be returned to the operating-room in perhaps two days, at which time the operation will be completed. We do not expect to have to cease our operating in the middle of the game today, but we have done so numerous times, and have always been glad we did, because it is only when the surgeon does too much that he has occasion to regret his activities with these cases.

To complete the history of this case: She has had for thirty years an irregular enlargement of her thyroid gland, which, as far as she knew, gave rise to no symptoms until about a year ago, at which time she began to lose weight, and was conscious of a rapidity and irregularity of her pulse, tired easily on exertion, and had occasional attacks of diarrhea. When she first came to the office she complained that she was just "run down" and had no thought that her symptoms were the result of her goiter, for she had noticed no change in the goiter at all.

On physical examination she has the usual findings, namely, tremor, tachycardia, increased reflexes, slight increase in blood-pressure, etc.

Laboratory Examination.—Urine analysis negative.

Blood examination: Hemoglobin, 80 per cent., red cells, 5,000,000; white cells, 8600, with normal percentages; Wassermann negative. Goetsch test: (*a*) Systolic: Rises 15 points within first ten minutes, begins to recede, and has returned to starting-point within forty minutes. (*b*) Diastolic: Drops 8 points in the first ten minutes, and has regained its former point within forty-five minutes.

Operation.—We use the usual collar incision, but a little higher than the level at which we formerly made our incision, with the skin-flaps retracted both upward and downward. Our muscle flaps are laid back on each side. This gives an adequate exposure of our thyroid. You will notice there is a large adenoma of the right lobe, a somewhat smaller one involving the isthmus and the left lobe. In the removal of a thyroid considerable care is taken to have hemostats on all vessels before they are cut; and avoid as much as possible traction on the thyroid for fear that by such traction we may injure the recurrent laryngeal nerve by making traction thereon or by pinching it with a hemostat. With the adenomatous portion of the thyroid removed one proceeds to ligate each point before the hemostat is released.

Where one has done a previous ligation of the superior thyroid one expects some difficulty in freeing the upper pole of the gland. With all bleeding points ligated, we proceed to the suturing of our muscle flaps.

We always use drainage in the cavity from which each lobe has been removed. This drainage is usually brought out through a stab-wound just above the suprasternal notch. We close our wound with catgut suture material. A liberal dressing is now applied.

The anesthetist assures me that there has been but little increase in the pulse-rate and the blood-pressure has been well sustained throughout the operation. We feel quite certain that this patient will not show as much storm following this operation as she did following the ligation.

CHOLECYSTECTOMY FOLLOWING ACUTE RUPTURE OF GALL-BLADDER WHICH OCCURRED TWO MONTHS AGO

Now our third case is again a second-stage operation, but this time a gall-bladder instead of a goiter. Mrs. Hester L., aged fifty-two, white, a housewife, the mother of 9 children.

Early History.—The usual children's diseases, otherwise unimportant.

Personal History.—Menstruated first at the age of thirteen, regular and normal, married at the age of twenty, the mother of 9 children, the youngest now ten years of age.

Present History.—For past eight years has had repeated attacks of "stomach trouble" and more or less continuous "indigestion." No attacks of severe colicky pain until a few weeks ago, when about 10 o'clock one forenoon she was ceased suddenly with a very severe pain in the abdomen, most severe in the upper right quadrant. She was compelled to lie down at once and vomited within less than one hour from the onset of the pain. Her family doctor was called, who washed out her stomach, had her given an enema, each without relief. He gave her $\frac{1}{4}$ grain of morphin by hypodermic, with but slight relief, and later in the afternoon repeated the hypodermic, with but little benefit. She was removed to the hospital that same evening, where I examined her for the first time. She had a rapid pulse; also complained of considerable pain, abdomen tender over entire extent and very rigid, no gas distention, her white count 16,600, red cells 6,000,000. She was diagnosed as an acute gall-bladder with the beginning of general peritonitis. Her condition was such that it was not deemed safe to give her a general anesthetic, and she was removed to the operating-room, where the abdomen was opened under a local anesthetic.

On opening the peritoneum, which was opened through an upper right rectus incision, there was an escape of quite a quantity of bile-stained fluid. This was really more than bile stained. It gave one the impression of being about one-half bile and one-half peritoneal fluid. On examining the gall-bladder it had ruptured near the fundus on the under surface, and had been draining into the peritoneal cavity. The gall-bladder contained one large stone, which was removed, a drainage-tube introduced into the gall-bladder and sutured there. A second wick tube into right flank beneath gall-bladder. A third rather large cigarette drain to bottom of pelvis. Abdomen closed and patient returned to bed.

She was quite sick for a period of three days, during which time there was a very free draining from the peritoneal cavity. She gradually improved, and left the hospital on the nineteenth day following operation. She was told that it would probably be necessary for her to return to have the gall-bladder removed. She re-entered the hospital two days ago, abdomen soft, but still complaining of her "indigestion."

Physical Examination.—Her physical examination and her laboratory examination were both negative except for a few white blood-cells in the urine. We expect at this time to remove the gall-bladder.

Operation.—We will reopen the right rectus, upper abdominal incision. On opening the peritoneum we encounter at once numerous adhesions. The fundus of the gall-bladder is easily identified, and the entire gall-bladder stripped free from its many adhesions rather easily. It has been our practice usually to remove the gall-bladder from within out, consequently, we will first identify our cystic duct, clamp it, and ligate reasonably close to the common duct. After cutting the cystic duct between the hemostat and the ligature the cystic artery is easily ligated. With the cystic duct and artery cut, the lower end of the gall-bladder is free, and one can easily strip it from its bed, leaving enough of the serous coat on either side that it can be sutured across the bed formerly occupied by the gall-bladder. We have never experienced any difficulty with a sharp knife separating this serous coat, and unless the gall-bladder is very much distended we never aspirate its contents, for it has been our experience with gall-bladder moderately distended one can dissect it more readily from its bed. When the inner two-thirds to three-fourths has been dissected free we then begin to suture the serous coat across the bed of the gall-bladder. Beginning at the stump of the cystic duct, which is first buried, then the free edges of the serous coat are drawn across with a running suture. With the gall-bladder removed we will introduce a cigarette drain, because of the presence in this field of a rather recent infection. We close the abdomen in layers about the drain.

We have liked to think in gall-bladder surgery of the gall-bladder itself being the seat of the disease, and consequently it has been our practice to remove the gall-bladder unless there is some particular reason for not removing it. With an acute gall-bladder such as this was at the previous operation we would, of course, never consider a cholecystectomy. When Evarts Graham published his article calling attention to the fact that in cases of cholecystitis one invariably had associated cholangitis, he did much to clear up our thinking in the surgical pathology of this region.

It is to this fact to which Evarts Graham has called our attention that many of our poor results can be attributed. I think all will agree that we have too many of these gall-bladder cases continuing to have symptoms following the operation. It is my feeling that by giving more consideration to the associated cholangitis and hepatitis that one will increase his percentage of actual cures, and it has been a question whether we should not adopt as a rule common duct drainage in all of our cases of cholecystitis. I am inclined to believe that it is the logical thing to do, although we did not do it in this case. In the after-treatment of these cases the internist should not be overlooked, for he feels that he can do much by proper dietetic regulation and proper increasing of fluid intake toward establishing a free biliary drainage. If his contention is correct his program will help very materially in clearing up the cholangitis.

CLINIC OF DR. J. EDWARD BURNS

CHRISTIAN CHURCH HOSPITAL

CALCULI IN THE KIDNEY AND URETER. DIAGNOSIS AND TREATMENT

The Cases Which Are To Be Presented Demonstrate Calculi in Different Portions of the Kidney and Ureter. The Methods of Diagnosing and Locating These Calculi in Their Different Positions. A Discussion as to Whether They Should Be Removed by Operation or Whether the Patient Should Be Allowed to Pass Them. The Different Types of Operation Employed in Their Removal.

CALCULI IN THE KIDNEY

Case I.—G. S. M., male, aged forty-two, farmer. Was first seen on January 21, 1920, at which time he complained of pain in the right side, and passing blood and stones in the urine. The family history and past history were negative. Present illness began twenty years ago. At this time the patient began having cramps in his abdomen, often accompanied by vomiting. These attacks would come on at intervals of from two to three months. Later on he went as long as eight years without an attack. The pain at first would appear on both sides, but was especially severe on the right. The pain radiated into right groin and testicle. Three years ago the patient passed blood in the urine for the first time during one of these attacks of right-sided pain. This was accompanied by burning and frequent urination, and he passed two stones. Six months ago, during another attack, he passed a stone.

Physical Examination.—Patient was a well-nourished man, mucous membranes good color. Heart and lungs negative. Abdomen negative. External genitalia negative. Rectal examination revealed a slight chronic prostatitis and seminal vesiculitis. Urine examination: Color yellow; reaction acid; specific gravity not obtained; sugar negative; albumin negative. On microscopic examination a few red blood-cells were found.

Cystoscopic Examination.—Residual urine none; bladder capacity 240 c.c. Cystoscope entered with ease. Study of the prostatic orifice showed no cleft anteriorly, no intravesical enlargement of either lateral lobe of the prostate. Median portion of prostate was elevated above the trigone, in the form of a slightly rounded median bar. Bladder wall showed much trabeculation and there was also slight injection of the vessels of the mucosa. Trigone was normal in appearance, as were both ureteral orifices. No cellules, diverticula, or calculi present, no tumors seen.

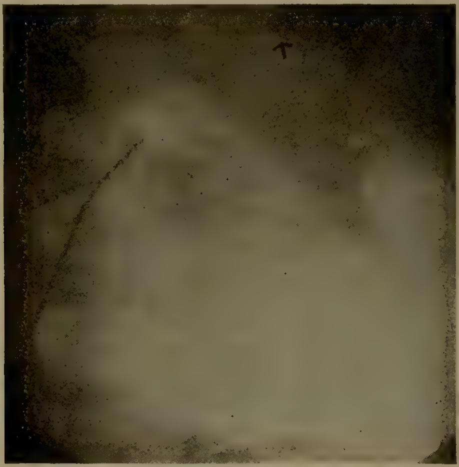

Fig. 788.—Plain Roentgen ray of right kidney, Case I, showing ureteral catheter in position, with outline of kidney and shadow of calculus in the upper pole.

Ureteral Catheterization.—A No. 6 catheter passed up to pelvis of both kidneys with ease. Urine from right kidney contained red blood-cells, epithelial cells, no bacteria; that from the left kidney showed red blood-cells ++, epithelial cells, no bacteria. Six mg. of phthalein were given intravenously. Appearance time on the right side seven minutes, and on the left side, six minutes. In one-half hour $13\frac{1}{2}$ per cent. was secreted by the right kidney and 15 per cent. by the left; 15 per cent. thorium solution was then allowed to flow into the pelvis of either kidney and ureter by gravity, and pyelograms made. Plain Roentgen rays of both kidneys were entirely negative except for a shadow in the upper pole of right kidney (Fig. 788). Pyelograms showed bilateral enlargement of both pelves. The shadow seen previously in the plain Roentgen ray seemed apparently to lie in the region of the upper median minor calix on the right side (Fig. 789).

Fig. 789.—Right pyelogram, Case I, showing dilated pelvis and calices, shadow of calculus in upper median minor calix.

Impression: Nephrolithiasis, right.

Reasons for Operation.—Stone seemed rather large to be passed spontaneously, and the patient was having more or less continuous pain. If the stone had been smaller, it might have been well to wait and allow the patient to pass it, in view of the fact that the urine was not infected. The condition had been present such a long time it was feared infection might occur at any time.

Operation.—Nephrolithotomy, right. After making a semilunar incision, extending from above and behind the tip of the twelfth rib around the costal margin for a distance of about 15 cm. and dividing the fat and fascia and muscles by sharp dissection, the lumbar triangle was exposed and pierced by a blunt clamp. This opening was then enlarged and the kidney exposed with difficulty, owing to the numerous adhesions which had to be ligated and divided. The kidney was normal in appearance and consistency, and was delivered into the wound with difficulty owing to the shortness of the pedicle. The stone was then located by measuring on the plain Roentgen-ray plate the distance of

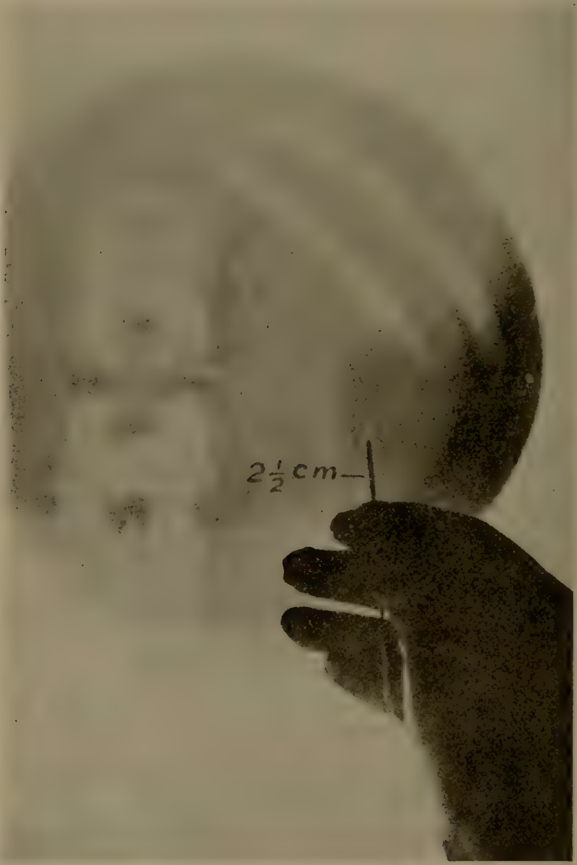

Fig. 790.—Showing approximate measurement of distance from the shadow of calculus to the lower pole of plain Roentgen-ray plate.

the shadow from the upper pole, and also from the convex border. A probe was then inserted perpendicularly through the cortex at the intersection of these two lines. This opening was enlarged by a clamp and the stone removed.

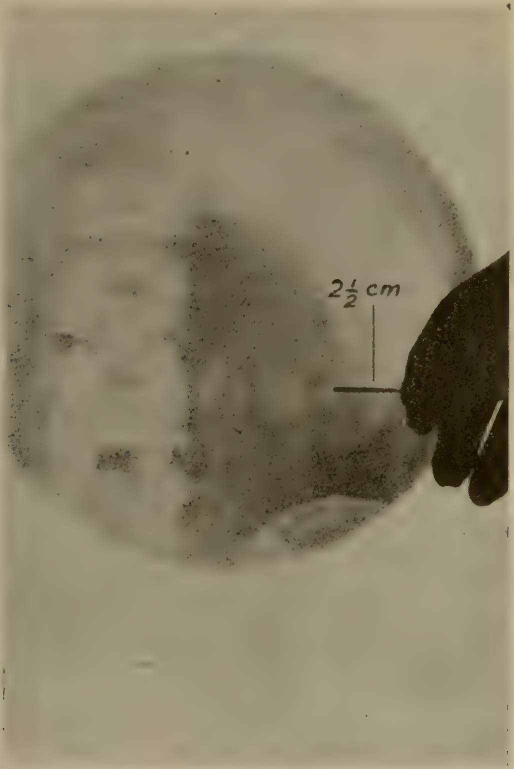

Fig. 791.—Showing measurement of distance of shadow of calculus from convex border of kidney.

This method of locating stones through the cortex has been previously described,[1] and found to be extremely useful where stones cannot be palpated (Figs. 790–793).

It has been found experimentally much better to tear the cortex of the kidney with a blunt instrument, such as a clamp, rather than cut it with a knife, because there is less bleeding and less scar-tissue formation in healing.

The stone removed was dark gray in color and measured about 1 x 1½ x 1 cm. It had a smooth surface and was very hard.

The nephrotomy wound was closed by a mattress-suture of chromic gut, care being taken not to tie this suture too tightly, so as not to cause destruction of renal parenchyma. The kidney was then returned to its bed, a rubber tube drain passed down to the nephrotomy wound, one cigarette drain to the upper pole of the kidney, and another down behind the kidney. The wound was closed in layers and the usual dressings applied. The patient left the table in good condition. The cigarette drains were removed in thirty-six hours and the rubber tube in ten

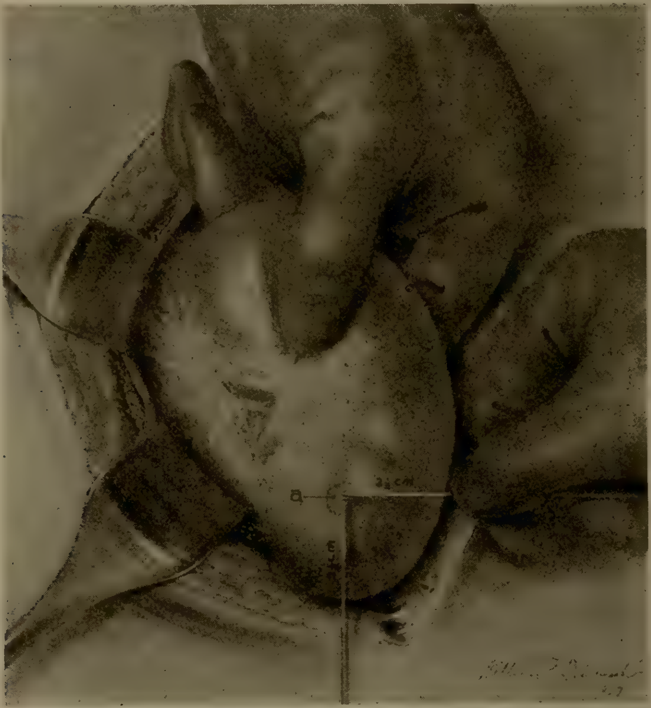

Fig. 792.—Showing method of applying measurements to kidney surface for locating point (*a*), at which exploratory puncture was made.

days. The patient's convalescence was uneventful. He was discharged from the hospital in three weeks.

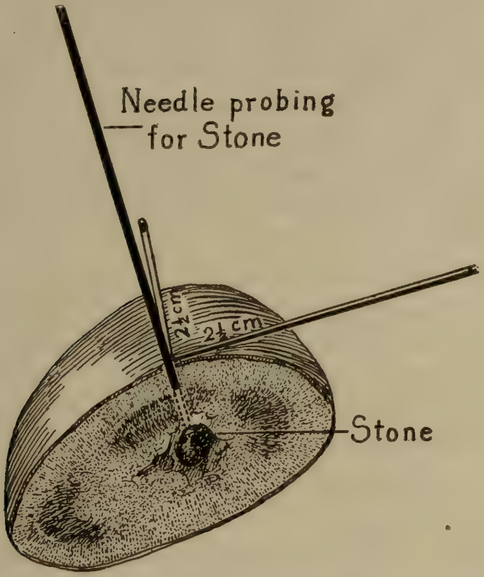

Fig. 793.—Showing method of probing for calculus.

Case II.—F. B. L., male, aged thirty-eight, farmer. Complained of pain in right side which radiated to the right groin and testicle. He also had pain in the bladder and frequency of urination. Family history and past history were negative. Present illness began twenty years ago. At that time patient first noticed burning and pain on urination; he did not pass any blood. This pain radiated from the bladder to the end of the penis and had gradually gotten worse. There was also marked frequency and urgency of urination. The patient was given bladder irrigations of boric solution, which seemed to increase the pain. Two years later the patient said the pain in the right side began, which radiated to the right testicle at times. Patient said there had been some blood in his urine ever since the bladder irrigations. At first the pain in the right side would come on at intervals of one month or six weeks, but the pain had gradually increased in severity and the intervals had become shorter.

For the past year the pain had been constant. At times the patient said he could hold his urine as long as from one to two hours, but there were intervals when he found it necessary to void every few minutes. For the past three weeks the burning on urination had been very severe and the urine was very cloudy. On standing it became jelly-like in consistency. The patient had been given morphin for the past eighteen years. Lately the pain in the bladder and the urgency and frequency of urination had been much more marked, while the pain in the region of the kidney was not so severe.

Physical Examination.—Patient was a poorly nourished man, mucous membranes pale. Heart and lungs negative. Abdomen flat, neither kidney palpable in the upright posture. No masses made out. There was tenderness beginning in the left flank near the mammillary line and extending well around to the back. There was also tenderness at the right costovertebral angle, and in the right lumbar region and suprapubically on deep palpation. External genitalia negative.

Urine Examination.—Color yellow, cloudy; reaction neutral; specific gravity not obtained; sugar negative; albumin 3+; microscopic examination, white blood-cells ++, red blood-cells, bacilli and cocci. Total phthalein output was 40 per cent. for the first hour and 10 per cent. for the second hour.

Cystoscopic Examination.—Patient's bladder was so extremely irritable that this had to be done under gas anesthesia. Residual urine and bladder capacity not obtained. Cystoscope entered with ease. Study of prostatic orifice showed no cleft anteriorly, no intravesical enlargement of either lateral lobe of the prostate, no elevation of the median portion of the prostate above the trigone. Trigone was reddened and edematous, both ureteral ridges were hypertrophied. Left ureteral orifice was normal in appearance. Right ureteral orifice was reddened and edematous and, on being watched, very cloudy urine was seen coming from it. Bladder wall throughout was fairly normal in appearance. No cellules, diverticula, or calculi present; no tumors seen.

Ureteral Catheterization.—A No. 6 catheter passed to pelvis of left kidney with ease. Attempts to pass a catheter up the right ureter were unsuccessful. Urine from left kidney showed a few red blood-cells, epithelial cells, no bacteria. Six mg. of phthalein given intravenously, appearance time on the left side six minutes, and in a half-hour 35 per cent. was excreted by this kidney. Transvesically at the end of a half-hour only a trace was found. Plain Roentgen ray of kidneys showed no shadow in the region of either kidney nor of either ureter. Roentgen ray of bladder showed no shadow in the region of the lower end of either ureter nor in the region of the bladder.

Impression: Pyonephrosis, right. A nephrectomy was advised on account of the right kidney being badly infected and functionless.

Operation.—Right nephrectomy. A similar incision was made to that described previously and the kidney exposed without difficulty. There were some adhesions at the lower pole, which were ligated and divided. The kidney was then delivered into the wound. It seemed larger than normal, very soft and mushy in consistency, and pale in color. In the pelvis could be felt a mass which was harder than the adjacent tissues. The ureter below was thick and fibrous. The ureter was caught between clamps and divided as low down as possible, both stumps being cauterized with carbolic acid. The pedicle was then clamped with three clamps and after being ligated with two ligatures of No. 3 chromic gut was divided. A rubber tube was placed down to the stump of the ureter, and one cigarette drain to the cavity occupied by the kidney. The wound was closed in layers and the patient left the table in good condition.

Pathologic Report.—On section of the kidney the pelvis was found to be greatly dilated, and there was a stricture at the ureteropelvic juncture. Above this point there was a stone measuring $\frac{3}{4}$ x 1 x $1\frac{1}{2}$ c.c. Stone was grayish in color, soft, and of a rough, mulberry type. The renal calices and pelvis were greatly dilated and full of flakes of pus and mucus. Mucous membrane was very much reddened and thickened and the calices were moth-eaten in appearance. Cortex was greatly thinned out and showed a well-marked pyelonephritis. On microscopic examination, the renal parenchyma showed varying grades of pyelonephritis. The pelvic epithelium was greatly thickened and showed marked inflammatory reaction. The patient made an uneventful convalescence and the wound healed *per primam*, except at the point of emergence of drains, which healed by granulation. The two cigarette drains were removed in thirty-six hours and the rubber tube in ten days. Patient was discharged from the hospital in three weeks, having no urinary symptoms whatever, and the urine being practically clear. The patient gained in weight markedly during his convalescence. In this case the stone was not shown on plain Roentgen-ray examination, as is true in about 15 per cent. of the cases of renal and ureteral stones. The opacity of a calculus to the Roentgen ray is almost entirely due to its calcium content. Although in this case the stone was in the pelvis, it was impossible to catheterize the right ureter, hence a wax-tipped catheter could not be passed to obtain a scratch. In this case pyelograms were not made for the reason that only the left kidney could be catheterized, and in such cases it is not desirable to take a chance of stirring up any reaction in the only good kidney. This case was also one where the stone was associated with stricture in the upper ureter.

Case III.—W. J. McC., aged twenty-eight, lineman for electric company. Complaint, incontinence of urine. Family and past history negative. Present illness: Fourteen months ago the patient was working on an electric pole, when he received a shock from the wires and fell, fracturing his spine. Since that time the patient had been catheterized constantly because of urinary retention, and had incontinence of urine when he was not catheterized. Patient stated he had never been able to void since the accident. This patient was referred to me from the Orthopedic Service of Doctor Frank D. Dickson, who performed a laminectomy of the tenth and eleventh dorsal vertebræ and did a Stöffel operation on both obturator nerves for spasticity.

Physical Examination.—Patient was a rather poorly nourished man; mucous membranes pale. Heart and lungs negative.

Abdomen negative except for anesthesia of skin. This anesthesia extended over the whole lower trunk and extremities. There was also spastic paralysis of lower extremities. External genitalia negative. Rectal examination: Anal sphincter poor tone, otherwise negative. Urine examination: Color yellow; reaction alkaline; specific gravity 1010; sugar negative; albumin, faint trace. Microscopic examination, white blood-cells +, bacilli, and cocci.

Impression: Bladder paralysis due to spinal cord injury.

Treatment.—A retention catheter was placed in the bladder and the patient was given daily bladder irrigations of 1 : 15,000 $AgNO_3$, the retention catheter being changed every third day. The total phthalein output was 50 per cent. for the first hour and 20 per cent. for the second hour. In about a month the patient developed an epididymitis (right), and catheterization was done at intervals for a while. After the epididymitis subsided the retention catheter was replaced and previous treatment resumed.

The numerous attempts to make the urine acid were unsuccessful, owing to the fact that every time acid sodium phosphate or urotropin were given for any length of time the patient developed marked gastro-intestinal symptoms, and his general condition did not seem to justify a continuance of the remedies. In about a year he passed a small calculus on withdrawal of the retention catheter. Shortly after that the patient developed pain in the left side of the abdomen; this was dull and aching in character, came on at intervals, and was accompanied at times by nausea and vomiting. The pain did not radiate, probably due to the paralysis.

Cystoscopic examination at this time showed a bladder capacity of 450 c.c. Study of the prostatic orifice showed no cleft anteriorly, no intravesical enlargement of either lateral lobe of the prostate. Median portion of prostate was elevated above the trigone in the form of a rounded median bar, which was probably relative, owing to the bladder paralysis. The trigone was reddened and edematous, as was the left ureteral orifice. Right ureteral orifice was normal in appearance. The bladder wall throughout showed a mild grade of cystitis and was trabeculated. No diverticula nor calculi present, no tumors seen.

Ureteral Catheterization.—A No. 6 catheter was passed to the pelvis of both kidneys with ease. Urine from right kidney showed epithelial cells and a few bacilli. Urine from left kidney showed white blood-cells few, epithelial cells, and numerous bacilli. Six mg. of phthalein were given intravenously. Appearance time was three and a half minutes on both sides. In a half-hour 25 per cent. was secreted by the right kidney and 10 per cent. by the left kidney; 15 per cent. thorium was then allowed to flow into the pelvis of either kidney by gravity and pyelograms were made.

Fig. 794.—Plain Roentgen ray, left kidney, Case III, showing shadow of calculus occupying entire pelvis and shadow of catheter superimposed.

Plain Roentgen ray of kidneys showed a shadow in the region of the pelvis of the left kidney, triangular in shape, measuring about 5 x 6 c.c. (Fig. 794). The catheter passed over the shadow. No other shadows were seen in the region of either kidney nor of either ureter. Roentgen ray of bladder showed no shadows in the region of bladder nor the lower end of either ureter. Pyelograms. The left pelvis was apparently completely filled by the stone. Calices were normal. Right pyelogram showed normal pelvis and calices and there was a normal ureteropelvic juncture on both sides (Fig. 795).

Operation.—Left pyelolithotomy. The usual kidney incision was made and the kidney delivered into the wound with difficulty owing to the numerous adhesions at both poles, which were ligated and divided. The posterior surface of the renal pelvis was then exposed and incision made in it about 3 cm. in length. A calculus was removed, being the exact shape and mold of the pelvis and calices, and measuring about 5 x 6 x $4\frac{1}{2}$ cm. The stone was roughened on the surface, was very hard, and brownish yellow in color. Ureteral catheter was then passed down to the bladder, meeting with no obstruction. The renal pelvis was irrigated with normal salt solution and explored with the finger. The incision in the pelvis was closed with interrupted sutures of fine catgut and the kidney returned to its position.

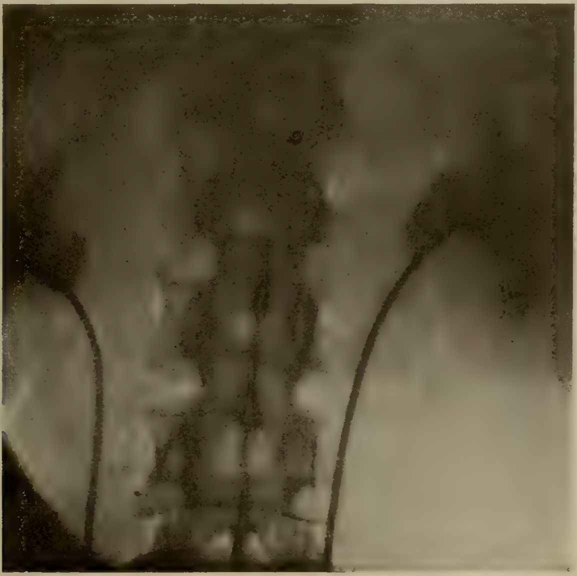

Fig. 795.—Double pyelogram, Case III.

One rubber tube was placed down to the line of sutures in the pelvis and one cigarette drain was placed in the neighborhood of either pole of the kidney. The wall was then closed in layers and the patient left the table in good condition. Postoperative treatment: The patient was given 1500 c.c. of salt solution subcutaneously on return to the ward. The cigarette drains were removed in thirty-six hours. On the second day after operation the patient had a temperature as high as 102.4° F. and a chill. He was given another 1500 c.c. of saline solution subcutaneously and temperature gradually came down to normal. Rubber tube was removed on the tenth day. Wound healed *per primam* except at point of emergence of tube and drains, and the patient's general condition improved very markedly after the operation. The patient was discharged from the hospital in about two months, still using his retention catheter.

This case is reported for various reasons. In the first place, after bladder paralysis, if the patient is catheterized, he is usually infected and catheterization has to be kept up. With an alkaline urine stones very frequently form in the presence of infection, and these cases should be Roentgen rayed rather frequently, with this fact in view. The patient has recently been able to tolerate acid sodium phosphate, and the urine has been made acid with the hope of avoiding the formation of other stones. The stone in the pelvis of the left kidney had to be removed even though the other kidney was infected, for fear of complete destruction of the left kidney. Stones of this type are best removed through the pelvis and not by means of a nephrotomy, for in these patients it is very essential to do as little harm to the renal parenchyma as possible.

Case IV.—Mrs. R. C. L., aged twenty, housewife. Complaint, pain in right side of back and passing blood in the urine. Family history and past history negative, except that the patient had pneumonia four years ago. The present illness began in October, 1922. At that time the patient had pain in the back on the right side for about two days and passed blood in the urine. This pain did not radiate to the groin. In January the patient had two other attacks of pain in right side of the back and passed blood in the urine. Patient described the pain as being dull and aching in character and being relieved by lying down. The patient said the pain was worse toward evening and after exercise, and not accompanied by any urinary symptoms except the passing of blood.

Physical Examination.—Patient was a well-nourished young woman, mucous membranes good color. Heart and lungs negative. Abdomen negative. Vaginal examination negative. Urine examination: Color, pale yellow; reaction alkaline; specific gravity 1022; sugar negative; albumin negative. Microscopically, red blood-cells +; white blood-cells few; no bacteria.

Cystoscopic Examination.—Cystoscope entered with ease. Study of vesical orifice showed no abnormality. Trigone was slightly reddened, ureteral orifices normal in appearance. Bladder mucous membrane normal. No cellules, diverticula, or calculi present; no tumors seen.

Ureteral Catheterization.—A No. 6 catheter was passed to pelvis of right kidney with ease. It was impossible to pass a larger catheter than a No. 5 up the left ureter. Urine from the right kidney, red blood-cells, epithelial cells, no bacteria. Urine from the left kidney, white blood-cells occasional, epithelial cells, red blood-cells +, no bacteria. Six mg. of phthalein were given intravenously, appearance time on the right side seven and a half minutes and on the left side six minutes. In a half hour 25 per cent. was secreted by the right kidney and 30 per cent. by the left; 15 per cent. thorium solution was then allowed to flow into pelvis of either kidney by gravity, and pyelograms made. Plain Roentgen-ray examination showed that outlines of both kidneys could be distinctly made out. In the right kidney just above the ureteropelvic juncture there was the shadow of a small stone which measured about $1\frac{1}{2}$ x 1 c.c. (Fig. 796). No shadows were seen in the region of the bladder nor the lower end of either ureter. Pyelograms: On the left side there was a small normal pelvis with normal calices. In the right side the pelvis was somewhat dilated, showing beginning hydronephrosis; calices were also beginning to be blunted (Fig. 797).

Impression: Nephrolithiasis, right. Reasons for operation were the fact that the stone was too large to be passed, the beginning of hydronephrosis and the pain in the back was becoming rather constant, causing a great deal of discomfort.

Operation.—Pyelolithotomy, right. The usual kidney incision as described above was made. The lumbar fascia was pierced by a clamp and the perirenal fat exposed. The kidney was exposed without difficulty and delivered into the wound.

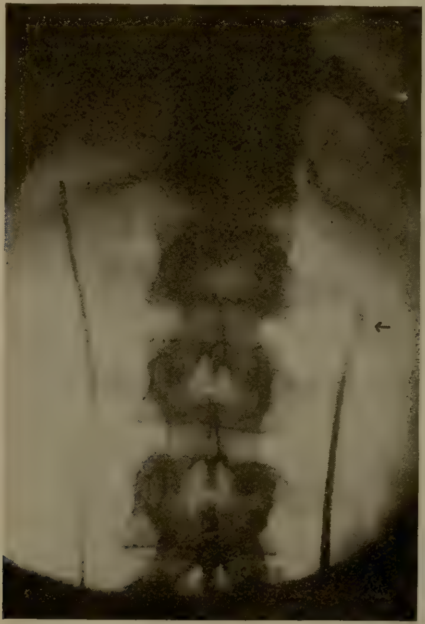

Fig. 796.—Plain Roentgen ray, Case IV, showing triangular shadow of calculus which is above tip of the ureteral catheter on the right side.

The stone could be readily felt in the pelvis of the kidney. An incision about $1\frac{1}{2}$ c.c. in length was made in the renal pelvis, and a small calculus, measuring about $1\frac{1}{2} \times 2 \times \frac{3}{4}$ c.c. was removed. The calculus was roughly triangular in shape, covered with spicules, mulberry formation, and brownish in color. A catheter was then passed down to bladder and finger introduced into pelvis of kidney for exploration, but no other stones were found. The wound in the renal pelvis was closed by interrupted sutures of fine plain catgut, a rubber tube placed down to the line of suture, and the kidney returned to its bed. One cigarette drain was placed down by the side of the rubber tube and another to the lower pole of the kidney. The wound was closed by through-and-through sutures of silver wire, and the skin by a continuous suture of fine black silk. The patient left the table in good condition. The patient's convalescence was uneventful. The two cigarette drains were removed in forty-eight hours, the rubber tube removed in ten days. There was no urinary drainage. The patient left the hospital in three weeks, the wound having healed *per primam* except at the point of emergence of tubes and drains. The urine examination was negative on discharge from the hospital.

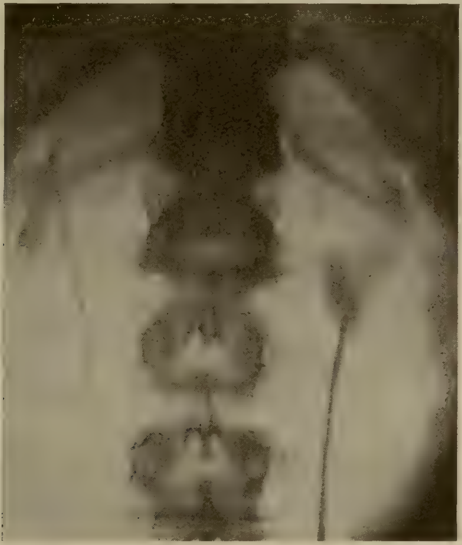

Fig. 797.—Double pyelogram, Case IV, showing dilatation of pelvis and calices.

URETERAL CALCULI

Case V.—F. J. E., male, aged twenty-six, manager of a grain elevator. This patient was first seen on October 12, 1920, when he complained of pain in right side and passing blood in the urine. Family history and past history were negative. Present illness began four years ago, at which time patient had pain in his back on the right side, which did not radiate, and passed blood in his urine. This attack lasted only a few days. He had a slight pain in his back at times until September, 1918, when he had two severe attacks of pain in the right side, which radiated to the right groin and testicle. There was no retraction of the testicle, and there was no blood in the urine at that time. The pain was so severe that the patient had to have morphin for its relief. The attack was accompanied by frequency of urination and there was also burning on urination at times. In October, 1919 the patient had another attack. Since this time he has had two similar ones, and at the time of the last attack the patient was operated upon for appendicitis. Each of these attacks was accompanied by nausea and vomiting. The patient did not have chills and fever. In August the patient had another attack, the pain being the most severe he had had. He had passed no blood since the first attack and had never passed any stones. For the past month he had found it necessary to get up once a night to urinate. There were no other urinary symptoms.

Physical Examination.—Patient was a well-nourished young man, mucous membranes good color. Heart and lungs negative. Abdomen negative except for a scar at the site of appendectomy. External genitalia negative. Rectal examination revealed a slight chronic prostatitis and seminal vesiculitis. Urine examination: Color pale yellow; reaction acid; specific gravity 1022; sugar negative; albumin negative. Microscopically, occasional red blood-cell, no bacteria. Prostatic secretion, white blood-cells, 5 per cent.; spermatozoa, 0; lethicin, +; compound granular, few; corpora amylacea, 0; epithelial cells few. Total phthalein test: First hour, 45 per cent.; second hour, 20 per cent.

Cystoscopic Examination.—Residual urine 0. Bladder capacity 110 c.c. Cystoscope entered with ease. Study of the prostatic orifice showed no cleft anteriorly, no intravesical enlargement of either lateral lobe of the prostate, no elevation of median portion of prostate above the trigone. Trigone was somewhat edematous, both ureteral orifices were edematous, particularly the right, which was crater-like in appearance. The bladder wall showed a moderate grade of cystitis. No cellules, diverticula, nor calculi present; no tumors seen.

Ureteral Catheterization.—A No. 7 catheter passed to pelvis of left kidney, but on the right side it could be passed for only half the distance. Urine from right kidney showed an occasional white blood-cell; red blood-cells +; occasional bacillus. Urine from the left side showed red blood-cells +++; no bacteria; epithelial cells. Six mg. of phthalein were given intravenously. The appearance time on the right side was five minutes and on the left side six minutes. In a half-hour 23 per cent. was secreted by right kidney and 30 per cent. by the left kidney. Wax-

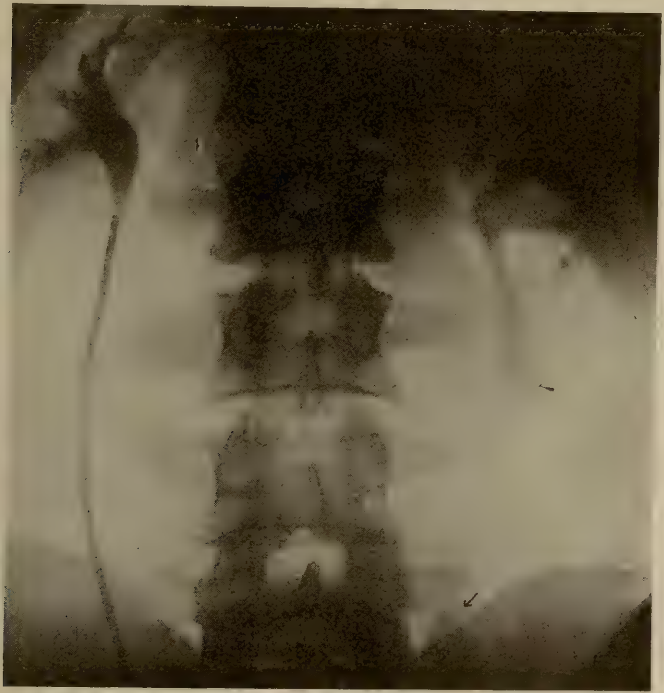

Fig. 798.—Double pyelogram, Case V, showing shadow of calculus on the right side, which is below the transverse process of the fifth lumbar vertebra; also dilatation of the right ureter.

tipped catheter passed up right ureter, met with obstruction about half-way up, and on withdrawal showed a definite scratch. Pyelograms: Outline of pelvis of left kidney was entirely normal, no shadows seen in the region of this kidney or ureter. Outline of pelvis of right kidney showed slight blunting of the calices and dilatation of pelvis and ureter, down to the transverse process of the fifth lumbar vertebra. At this point there was the shadow of a stone (Fig. 798). No shadows were seen in the region of the bladder nor in the lower end of either ureter.

Impression: Calculus in left ureter at the level of the transverse process of the fifth lumbar vertebra. Reasons for operation were that the stone was too large to be passed, that infection was present, and that there was beginning hydronephrosis and hydro-ureter.

Operation.—Ureterolithotomy, right. The patient was placed on laparotomy table, cleaned up in the usual manner, and incision made, beginning above and to the outer side of the antero-superior spine of the ileum, and extending parallel to Poupart's ligament to about its middle. An exaggerated McBurney incision was made and the peritoneum was pushed toward the midline, the ureter being readily exposed, a catheter having been introduced into it before the operation was begun. The ureter was found to be greatly thickened, measuring about 1¼ cm. in diameter. It was delivered into the wound and the calculus readily palpated. Incision was made over it, and a roughened, mulberry calculus, dark brown in color, removed, measuring 1½ x 1¼ cm. A wax-tipped catheter was then passed up to the pelvis of the kidney and no scratch obtained. There were no stones below, as the catheter had never met any obstruction in passing until the time the calculus removed was encountered. The wall of the ureter was united by three interrupted sutures of plain catgut. A rubber tube and cigarette drain were placed down to the incision. Abdominal wall was closed in the usual manner in layers, usual dressings applied, and patient left the table in good condition.

The patient's convalescence was uneventful. The cigarette drain was removed in thirty-six hours, the rubber tube in ten days. There was no urinary drainage. On discharge from the hospital, wound had healed *per primam*, except at the point of emergence of tube and drain, and this had granulated well. No areas of induration nor tenderness in the scar. The patient could hold his urine as long as five hours. There was no dysuria. Urine voided in three glasses; glasses one, two, and three clear. Urine examination was negative except for the presence of an occasional red blood-cell.

Case VI.—Mrs. O. G., aged thirty-nine, housewife. Patient was first seen August 1, 1921, complaining of pain in the left side. Family history and past history were negative except for the fact that in March, 1908 the patient had had a pelvic abscess, which was opened and drained through the cul-de-sac. This was again opened and drained in June, 1908.

Present illness began five years ago, since which time patient had had what she called lumbago. On June 1st the patient went to bed with a nervous breakdown, and for about three weeks had a severe pain in the left side and back, which radiated to the groin. Pain was relieved by morphin and was accompanied by nausea and vomiting and abdominal pain. On July 2d patient had a severe chill and elevation of temperature. Three days later patient had another chill and elevation of temperature. Patient had had two attacks of pain since the first which were similar in character. She had had an elevation of temperature about once a week. After an attack of pain patient had some frequency of urination and burning on urination. She had the last attack of pain about ten days before, since which time her temperature had gradually come down to normal.

Physical Examination.—Patient was a well-nourished, somewhat anemic looking woman, mucous membranes fair color. Heart and lungs negative. Blood-pressure 110 over 90. Abdomen negative. Vaginal examination: Patient had some relaxation of vaginal outlet, there was a slight leukorrheal discharge present. Vaginal orifice readily admitted two fingers; there was no tenderness in the lateral fornices. Uterus was anteflexed, but not very freely movable. On pressing upward on the cervix there was intense pain in the suprapubic region.

Urine Examination.—Color yellow; reaction alkaline; specific gravity 1010; sugar negative; albumin negative. Microscopic examination: White blood-cells ++; red blood-cells +; epithelial cells; bacilli +++. Total phthalein, 60 per cent. first hour, 15 per cent. second hour.

Cystoscopic Examination.—Residual urine 0; bladder capacity 350 c.c. Cystoscope entered with ease. Vesical orifice seemed normal. Bladder wall throughout was normal in appearance. Trigone was also normal. Left ureteral orifice was slightly reddened. The right was normal in appearance. No tumors, calculi, nor cellules present, no diverticula seen.

Ureteral Catheterization.—A No. 7 catheter was passed up to the pelvis of the right kidney with ease. On the left side catheter would only pass about one-third of the distance. Urine from the right kidney contained red blood-cells ++; epithelial cells; no bacteria. Urine from left kidney contained numerous pus-cells; red blood-cells +; bacilli ++. Six mg. of phthalein were given intravenously. Appearance time fourteen minutes. On the right side 10 per cent. was secreted in half an hour, on the left side 9 per cent.; 15 per cent. thorium solution was allowed to flow by gravity into the pelvis of either kidney and pyelograms made.

Roentgen Ray Examination.—Plain Roentgen ray of kidneys showed no shadows in the region of either kidney nor of either ureter. Ureteral catheter on the left side was only introduced up to the level of the brim of the pelvis and just above its end was seen the shadow of a small stone. On the left side the outline showed the pelvis and calices to be somewhat dilated. Outline of the ureter could not be made out owing to imperfect filling. On the right side the pelvis of the kidney seemed normal in appearance; there was some narrowing of the ureter below the ureteropelvic juncture. Wax-tipped catheter passed up the left ureter showed a definite scratch.

Impression: Ureteral calculus, left. Reasons for operation:

Infection, beginning dilatation of the pelvis of the kidney and calices.

Operation.—Ureterolithotomy, left. A similar incision was made to the one described in the previous case. Peritoneum was pushed toward the midline, the ureter freed without difficulty, it being easily found, on account of a catheter having been previously introduced into it before the operation was begun. Two small stones could be readily palpated through the ureter, which was thickened only slightly. An incision about 1½ c.c. in length was made over them and the two stones were removed. These were small, grayish brown in color, roughly triangular in shape. A catheter was passed down to the bladder, and up as far as the pelvis of the kidney, meeting with no obstruction. The wall of the ureter was then sutured by two interrupted sutures of plain catgut, and a rubber tube drain placed down to the incision. Cigarette drain was placed down to the same point, parallel with the rubber tube. The wound was closed, layer by layer, with the usual McBurney closure. The patient left the table in good condition.

Postoperative Treatment.—1500 c.c. of salt solution were given subcutaneously. The cigarette drain was removed in thirty-six hours and the rubber tube on the tenth day. The patient was discharged from the hospital in three weeks, the wound having healed entirely, except at the point of emergence of tube and drain, which healed by granulation. The patient was last seen on February 1, 1922, and she had gained 15 pounds in weight and felt splendidly.

Case VII.—W. E. C., aged thirty-seven, banker. Patient was first seen April 1, 1921, at which time he complained of pain in the left side and passing blood in the urine at times. Family history and past history were negative except for the fact that the patient had had diarrhea for the past five or six years, which condition was worse in warm weather. Present illness began six weeks ago, at which time patient noticed an aching pain across the small of his back, which lasted about three-quarters of an hour. The pain was relieved by urination. There was no blood in the urine at that time. Patient had another similar attack in two weeks, which lasted about the same length of time. On voiding, he noticed that the urine was colored red. There were no other urinary symptoms with this attack. Patient had a similar attack in ten days, and blood was present in the urine on two voidings. Four days before patient was seen he had another attack which was more severe, pain being definitely localized in the left side, but did not radiate to groin or testicle. There was pain and burning on urination, pain radiating to the end of the urethra. This attack lasted about four or five hours, during which time he passed blood in his urine. After it was over the urine became clear and the urinary symptoms subsided. There were no gastro-intestinal symptoms. Patient felt perfectly well until April 1, 1921. That morning there was burning on urination and the urine was blood red.

Physical Examination.—Patient was a rather poorly nourished, somewhat anemic looking man, mucous membranes fair color. Heart and lungs negative. Abdomen negative. External genitalia negative. Rectal examination showed the presence of a slight chronic prostatitis. Urine examination: Color yellow, slightly cloudy; reaction alkaline; specific gravity 1022; sugar negative; albumin negative. Microscopically, white blood-cells occasional; red blood-cells ++; occasional diplococcus. Total phthalein test: First hour 25 per cent., second hour 25 per cent.

Cystoscopic Examination.—Residual urine 0; bladder capacity 400 c.c. Cystoscope entered with ease. Study of prostatic orifice showed no cleft anteriorly, no intravesical enlargement of either lateral lobe of the prostate, no elevation of the median portion of prostate above the trigone. Trigone was reddened and edematous. Right ureteral orifice was normal in appearance, left ureteral orifice could not be made out owing to the large amount of bullous edema surrounding it, which is greatly elevated above the surrounding inflamed mucous membrane. Projecting from the center of this mass of bullous edema was a small grayish-white irregular shaped calculus. The bladder wall showed a slight cystitis. No cellules, diverticula, nor tumors seen.

Impression: Calculus in the lower end of the left ureter which was projecting slightly into the bladder.

The treatment advised was fulguration of the ureteral orifice, so that the stone might be passed. This was done twice and the patient passed a grayish-yellow, irregular shaped calculus, measuring about $\frac{1}{2}$ x $\frac{3}{4}$ x $\frac{1}{2}$ c.c. The patient was cystoscoped ten days later and the bladder seemed normal in appearance. The patient was seen several times since and has been entirely free from any symptoms.

Case VIII.—R. E. H., aged fifty, retired farmer.

Patient was first seen on November 10, 1922, at which time he complained of pain in left side of abdomen, nausea, and vomiting. Family history and past history were negative, except that patient had gonorrhea at twenty-one years of age. Present illness: For three or four years patient had had pain in right side of abdomen at times. On November 2d patient was awakened by general cramping pain in the abdomen, the bowels moved, and about the same time the pain became localized in the left lumbar region. Patient had nausea and vomiting, but no chills. In twenty-four hours the pain began to radiate to the left iliac region and the left groin and testicle, causing retraction of testicle. There was no blood in the urine except at one time, and only a very slight amount then. There were no urinary symptoms. Pain, nausea, and vomiting, however, had been more or less constant until the above date. Patient stated that when lying in bed if he turned on his right side and voided the pain would be relieved.

Physical Examination.—The patient was a well-nourished man, mucous membranes good color. Heart and lungs negative. Abdomen negative except for tenderness in the left iliac region. External genitalia negative. Rectal examination showed a moderate chronic prostatitis and seminal vesiculitis.

Urine Examination.—Color yellow; reaction acid; specific gravity not taken; sugar negative; albumin a trace. Microscopically, white blood-cells +; epithelial cells, no bacteria.

Cystoscopic Examination.—Residual urine 0. Bladder capacity 450 c.c. Study of the prostatic orifice showed no cleft anteriorly, no intravesical enlargement of either lateral lobe of the prostate. Median portion of the prostate was slightly elevated above the trigone in the form of a rounded, median bar. Trigone was somewhat atrophic. The right ureteral orifice was normal in appearance. The left ureteral orifice was reddened and edematous and bulging, there evidently being a stone in the intramural portion of the ureter. The bladder wall was normal in appearance. It showed a slight grade of trabeculation. No cellules or diverticula present, no tumors seen.

Roentgen ray of kidneys showed bilaterally enlarged kidney shadows. No shadows of calculi seen in the region of either kidney. In the lower end of the left ureter, however, there was the shadow of a small calculus. A wax-tipped catheter passed into the left ureteral orifice showed a definite scratch on withdrawal. After this manipulation the patient was completely relieved of his pain, showing that the calculus had been so turned around as to allow the escape of urine on this side and do away with the back pressure of the urine on the kidney which causes most of the pain in these cases. The orifice was fulgurated, the fulguration being carried up over the bulging part of the ureter, so as to enlarge the ureteral opening. In about one week the patient passed the calculus.

DIAGNOSIS

The fact that many cases of ureteral and renal calculi are mistaken for abdominal conditions makes it very important that those patients having indefinite abdominal pain should have a thorough urologic study before any operation is undertaken. When the pain is right-sided, the conditions most commonly confused with calculi in the urinary tract are appendicitis, gallstones, and in the female, diseases of the pelvic organs. Many mistakes of this kind would be avoided if the surgeon would go to the trouble to have Roentgen rays made and a careful urinary examination done before operating where indefinite abdominal pain is the chief symptom.

SYMPTOMATOLOGY

Pain is the most constant symptom, and may present a very wide variation both as to extent and radiation. The severity of the pain seems to bear no relation whatever to the size of the stone, for there are many cases in which the pain is most intense and prolonged, and the calculus, when passed, no larger than a grain of wheat. Most commonly the pain begins in the back, radiates along the course of the ureter to the groin and to the penis or testicle, often causing retraction of the testicle. However, it may be entirely confined to the back or the lower portion of the abdomen. In the case of stones in the lower portion of the ureter the pain is often brought on or exaggerated by defecation. The pain may radiate to the hip, across the abdomen or to the perineum. Pain is due not so much to the passage of the stone as to the back pressure of urine on the pelvis of the kidney, causing its distention. The urinary symptoms most commonly found are frequency, hematuria, dysuria, and sometimes incontinence.

Examinations of the urine should be very carefully and frequently made both during and after the attack of colic, and nearly always red blood-cells will be found; sometimes pus; and again, red blood-cells, pus, and bacteria also may be found. This latter finding, in the third glass of urine in the male or in the catheterized specimen in the female, is deemed of the greatest importance, for thereby infection associated with the stone is very strongly suspected and should be investigated.

Gastro-intestinal symptoms very frequently accompany the pain and are often quite persistent, the nausea and vomiting in some cases of ureteral stones giving rise to rather extreme prostration. Chills and fever may also be associated with these other findings and are almost always indicative of the presence of infection.

Roentgen Ray Examination.—The Roentgen ray is the most valuable aid at our command in diagnosing and locating renal and ureteral calculi. However, in about 15 per cent. of the cases the shadows of the calculi are not seen in the plain Roentgen ray examination. A common cause of their not being found is that the shadow is superimposed upon the shadow of some bony structure. After the shadow is seen the next important thing is to determine whether it lies outside or within the urinary tract. The shadows outside the urinary tract most commonly confused with those of calculi are the shadows of phleboliths in the pelvis and also those due to intestinal contents. The use of opaque ureteral catheters, shifting of the Roentgen-ray tube, and making double exposure on the same plate, as advised by Kretschner, and the making of pyelograms and ureterograms, are the means we have to demonstrate whether or not the shadow lies within the urinary tract. Another most important aid is the use of the wax-tipped catheter. When a definite scratch is obtained on this, it is proof positive evidence that the stone lies within the ureter or pelvis of the kidney. The shadows of calculi which are not seen in the plain roentgenogram are often brought out very distinctly in the pyelogram or ureterogram. These shadows are generally seen then because the medium used in making the pyelogram or ureterogram is more opaque to the Roentgen ray than is the calculus itself. Hence, the outline is made out as a less opaque area. This has been found to be true in the use of thorium solution as a pyelographic medium.[2] Pyelograms are also useful in showing the amount of damage being done to the kidney and ureter by the degree of dilatation of the renal pelvis and the ureter. In the case of ureteral stones the dilatation of the ureter down to the point of obstruction often definitely locates the position of the stone. The pyelogram also shows whether the calculus lies in the pelvis, calices, or in the renal cortex. Great care should be used in making pyelograms. For instance, in Case II it had been demonstrated that the infected kidney was useless, and it was therefore thought unnecessary to take a chance of stirring up a reaction in the good kidney by making double pyelograms. Whenever there is any doubt about the draining off of the pyelographic medium from the pelvis of the kidney, the catheter should always be left in place until it is felt that this has been accomplished. If both kidneys are badly infected and there is marked diminution in the phthalein output on both sides, a pyelogram should only be attempted on one side at a time.[2] Ordinarily, there is very little if any reaction in making pyelograms if care is used in the selection of pyelographic medium and if the condition of the kidneys determined previously is found to be good. Thorium solution has been in constant use at the Brady Urological Institute of the Johns Hopkins Hospital ever since its introduction in 1915.[3] There have been practically no untoward effects from its use.[4, 5, 6] The solutions of the iodids introduced by Cameron[5] for this purpose are also very excellent. In making pyelograms the solution should always be allowed to flow into the renal pelvis and ureter by gravity, and not forced in by means of a syringe, for it has been shown experimentally that it is impossible to determine by the sense of touch how much pressure is necessary to fill the renal pelvis and avoid forcing the solution out into the renal parenchyma.

TREATMENT

After a positive diagnosis of calculus in the upper urinary tract has been made the question arises as to whether the patient should be allowed to pass the stone or whether there should be immediate operative interference for its removal. A fairly large number of these calculi will be passed either spontaneously or after treatment, and lately there has been a great trend toward conservatism in the treatment of these cases. If the calculus is small enough to pass and the kidney function on the affected side is good and no infection is present, non-operative treatment should be invariably employed.

Stones too large to be passed should always be removed as soon as possible because of the possibility of the damage they may cause; especially is this true where the stone is found in an only remaining kidney. If, however, infection is present, the stone should be removed as soon as possible, no matter what its size, because of the possibility of ascending infection and a consequent suppurative pyelonephritis, which, if allowed to go on, may necessitate a nephrectomy. For this reason the presence of infection and the size of the stone are the most important factors in determining whether the case should receive operative or non-operative treatment.

Non-operative Treatment.—Often after a simple ureteral catheterization the patient is entirely relieved of the pain because of the fact that the stone is so turned around as to allow drainage of the urine past it.

CASE VIII

Sometimes after this procedure the calculus is passed almost immediately. Sometimes the injection of oil or the use of various agents to relax the muscular coat of the ureter will aid in the passage of the stone. If the stone lies in the intramural portion of the ureter or can be seen projecting into the bladder through the ureteral orifice, fulguration of the orifice, as demonstrated in the 2 cases quoted above, is most effective for widening the orifice and allowing the passage of the stone (Cases VII and VIII). In such cases the orifice may also be dilated by means of a Garceau catheter or by a special dilator devised by Bransford Lewis, and sometimes the stone may be grasped by forceps and withdrawn from the orifice. Ureteral strictures when associated with stones should always be dilated, so as to prevent the formation of further stones.

Operative Treatment.—The type of operative procedure to be decided upon depends upon the size and location of the stone and the amount of impairment to the kidney already present. In Case I, although the calculus lay in one of the minor calices and might have been removed through an incision in the pelvis, it was decided to locate it by the method described above and remove it through the cortex. If it had been removed through an incision in the pelvis damage would have been done to this portion of the kidney, due to manipulation on account of the location of the calculus, whereas it was removed through a rather small nephrotomy wound. Should the calculus be large, filling the entire pelvis and calices, it is sometimes necessary to remove it by doing a nephrotomy. However, this is to be avoided if possible, and the calculus removed through a pyelotomy wound, because in the first procedure there is always more or less permanent damage to the renal parenchyma. If, as in the case of the calculus just described, or in the case of numerous small calculi with a badly infected kidney which has very poor function or is functionless, a nephrectomy should be done (Fig. 799).

If the kidney destruction has gone beyond the point where recovery is possible, and if the calculus alone be removed, a nephrectomy may be necessary later. Therefore, it is better to save the patient the second operation, which is always very difficult and dangerous. Calculi in the pelvis should, as a rule, be removed through a pyelotomy wound, as in Cases III and IV. An important procedure in these cases is to place drainage down to the line of sutures in the pelvis. These drains should always be left in place as long as there is any urinary drainage to prevent the possibility of the formation of a perinephritic abscess from extravasating urine. After the calculus has been removed the pelvis of the kidney should always be explored with the examining finger to see that no pieces are left. It is also very important to pass a wax-tipped catheter down to the bladder to see that there are no remaining stones in the ureter.

Fig. 799.—Plain Roentgen ray, showing large calculus occupying the entire pelvis and extending into the calices. Urine from this kidney was badly infected, the phthalein output greatly diminished. Such a case would probably require a nephrectomy.

In the case of ureteral calculi the type of operation decided upon depends upon the location of the calculus in the ureter. If it lies in the upper third of the ureter the incision should be the same as for the exposure of the kidney, while if it is in the middle or lower thirds of the ureter, an exaggerated McBurney incision, carried well out toward the anterosuperior spine of the ileum and parallel to Poupart's ligament, will generally suffice for the proper exposure of the ureter. Before any operation for a stone in the ureter is undertaken it is always well to have an immediate Roentgen-ray examination, to be sure that the calculus has not been passed, and also to be sure that it is in the same location as at the last examination, and has not slipped back up into the pelvis of the kidney, as sometimes occurs. A very good procedure to avoid delay in finding the ureter is to introduce a ureteral catheter into it before the operation is begun. Thus, when the peritoneum is pushed toward the midline, with the ureter adhering to its posterior surface, the latter can be readily palpated on account of the presence of the catheter within it. After the calculus has been removed from the ureter the ureterotomy wound should be sutured together by interrupted sutures and a drainage-tube placed down to the line of suture. Here, as in the case of the kidney, the drainage should be left in place as long as there is any urinary drainage, and it is usually a safe rule to leave these drains in place for at least ten days after the operation whether any urinary drainage is present or not.

SUMMARY

In cases of indefinite abdominal pain a thorough urologic examination should always be made, for in this way many patients will be saved from unnecessary operations.

Conservatism and the use of non-operative treatment are always to be urged where the stone is small enough to be passed and no infection is present.

The size of the stone and the presence of infection are the deciding factors in determining whether operative or non-operative treatment is to be used.

The type of operation performed should always be determined by the size and location of the stone and the amount of infection present, and it should be done with a view of causing the least possible damage to the kidney or ureter.

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INJURIES TO PERIPHERAL NERVES ASSOCIATED WITH FRACTURES

We wish first to present 4 cases which illustrate the injuries which may occur to peripheral nerves in conjunction with fractures. Industrial and war surgery have very clearly demonstrated that wherever severe trauma to a part occurs the possibility of injury to peripheral nerves must be considered. This is particularly true in fractures of the extremities.

Case I.—W. W., aged five years. August 31, 1922 patient fell on his right arm sustaining a supracondylar fracture of the right humerus. Almost at once the region of the elbow became swollen and black; this swelling and discoloration extending downward to the wrist. The arm was put up in the Jones position and plaster applied. Within three or four days acute flexion of the fingers was noticed, and attempts to straighten them caused great pain. The cast was removed in three weeks, at which time the fingers, thumb, and wrist were acutely flexed and great pain was still complained of when attempts were made to straighten them. The patient also complained of numbness in all the fingers, and there was a large slough in the cubital space. The extreme pain on attempt to straighten the fingers and wrist persisted for about a week or ten days, after which time, although the thumb, fingers, and wrist remained acutely flexed, no particular pain was noted when attempts were made to straighten them.

The patient on October 11, 1922, six weeks after injury, presented the following: General examination of patient negative. Examination of right arm: The musculature of the arm showed a moderate amount and the forearm a marked degree of atrophy. A scar of an old slough was noted in the cubital space. The elbow was held in right angle flexion and had about 15 degrees of motion. There was a large callous formation which could be palpated about the lower end of the humerus, and the internal condyle was unduly prominent (Fig. 800).

The wrist, thumb, and fingers were strongly flexed and could not be extended to any extent even when considerable force was used (Fig. 801). This seemed to be due to the contractions of the flexor tendons rather than to a paralysis of the extensors. The palm of the hand was scaly and the end of the index-finger slightly atrophied. There was some atrophy of the thenar eminence. Nails showed no marked changes. Sensation was de-

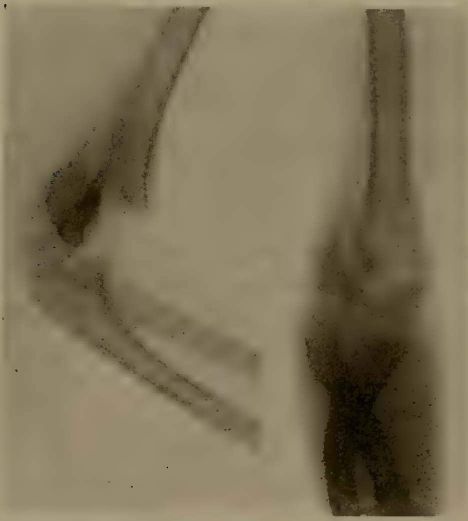


Fig. 800.—*x*-Ray of the elbow at the time of examination.

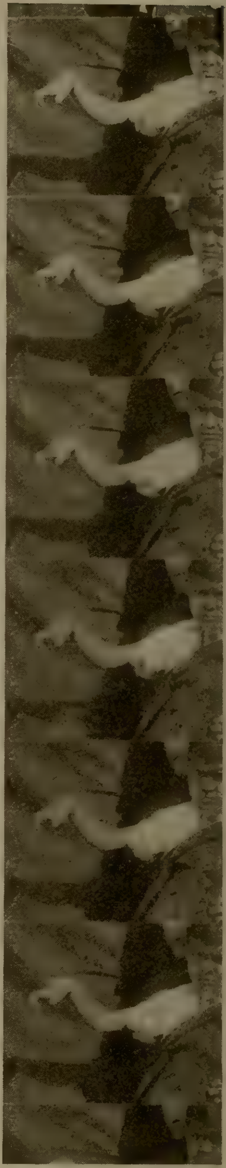


Fig. 801.—The hand and arm before operation. Note the flexion contractures and the lack of extension and flexion movement.

pressed on the entire median and ulnar distribution to pin pricks and to heat and cold from the middle of the forearm down. The diminished sensation was distinctly less marked over the little and ulnar side of the ring finger, which is the terminal sensory distribution of the ulnar nerve. (Age and temperament of patient made it difficult to determine the exact degree of sensory interference.)

The Wassermann, blood, and urine tests were negative.

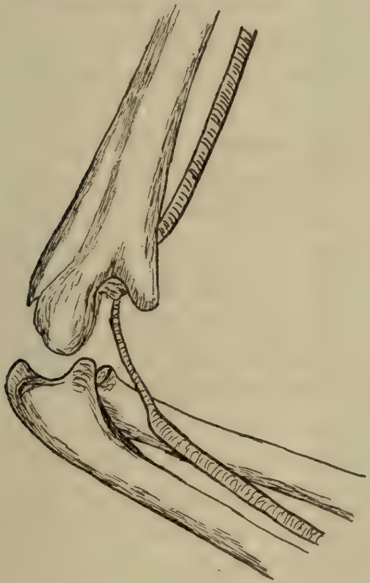


Fig. 802.—A diagram of the elbow drawn at the time of the operation. Note the diminished size of the median nerve.

The nature of the injury, together with the contracted flexor tendons and the interference with sensation chiefly involving the median nerve distribution, clearly indicated an injury to the median nerve of an irritative type, rather than a division, with the possibility of some involvement of the ulnar nerve. Since this condition had existed for six weeks without any improvement and with the gradually increasing deformity, an exploration of the median and ulnar nerves was indicated.

Operation was performed on October 18, 1922. The median nerve was exposed by a 4-inch incision along the inner margin of the biceps tendon. The nerve was found to be hooked around the distal end of the proximal fragment of the humerus and was embedded in dense scar tissue (Fig. 802).

The nerve was dissected free and was found to be hard, sclerotic, and very much decreased in size for an extent of 4 inches. A neurolysis was done and the nerve transplanted into a groove which was made in the biceps muscle. The ulnar nerve was then explored, but showed no gross evidence of injury. The bellies of the flexor muscles of the forearm, which were exposed by the incision, showed distinct fibrous degeneration. The incision was then closed by layers. The flexor tendons were still contracted under the anesthetic. The wrist, fingers, and thumb were forcibly straightened and a palmar plaster splint was applied to hold them in the corrected position.

Within a few days following the operation there was an improvement in sensation in all fingers except the index. The power of flexion and extension gradually returned, and by December 9th the patient had fairly good control of the hand.

The splint was worn constantly for two months, being changed from time to time into more dorsal flexion, as the flexor tendons relaxed. The splint was removed several times each day for massage and exercise; it is still being worn at night. As you see the patient now, he has practically normal movement of the hand with the exception of the index-finger, and this is improving. The sensations are normal, except the index-finger, where it is definitely depressed (Figs. 803, 804).

In this case the nerve was injured through becoming caught by the proximal fragment at the time of injury. In this position the pressure on the nerve by the bone caused primarily irritation of the nerve, with the contraction of the muscles supplied by it, giving the flexion deformity; at this time an attempt to extend the fingers was very painful. Later, degeneration of the nerve occurred and interference with its conductivity, causing a loss of power in the contracted flexor muscles and interference with sensation; at this time attempt to straighten the fingers did not cause pain. There could be no possibility of recovery in this

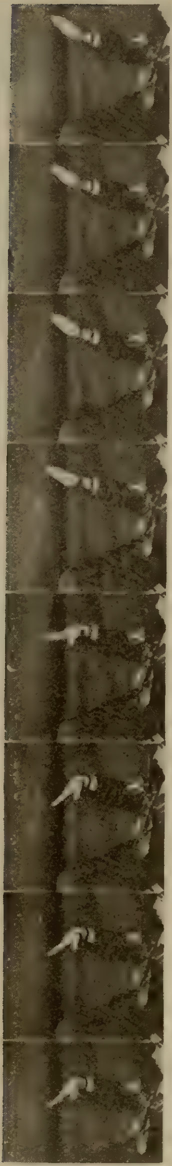


Fig. 803.—Motion pictures of the patient after operation, showing the flexion and extension at the wrist.

Fig. 804.—Motion pictures of the patient after operation, showing the flexion and extension of the fingers and hand.

case unless the nerve had been freed. The relief of pressure on the nerve by removing it from its abnormal position and by doing a neurolysis allowed the nerve-fibers to regenerate and the conductivity to be restored. The failure of the index-finger to keep pace with the rest of the hand in recovery seemed to be due to a more severe degree of injury to the fibers supplying this member.

The stretching of the contracted tendons by the plaster splints was a very important part of the after-treatment, as we could not expect a return of function until the deformity due to these contractures had been overcome.

Case II.—W. N., aged ten years. On January 7, 1923 the patient fell backward, striking on the left hand and elbow. In a very few minutes the parent noticed a great amount of swelling from the elbow to the middle third of the arm, the skin being very blue and tense.

The arm was immediately *x*-rayed and reported a supracondylar fracture of the left humerus. The next morning the fracture was reduced under an anesthetic and put up in the Jones position. Within a very few hours after being put in acute flexion the patient complained of a tingling sensation and a numbness on the dorsal surface of the thumb. Some ten days later the parent noticed a wrist-drop, but paid little attention to the deformity at that time, supposing it to be due to the position of the arm in the dressing. At the end of three weeks the wrist-drop was more pronounced, and it was found that the little fellow could not extend the wrist, fingers, or thumb. At the end of five weeks the Jones position was abandoned and a cock-up splint was applied to the hand and was worn for three weeks without noticeable improvement. The parents, having noticed no change for the better in the condition and being discouraged with the treatment, sought consultation.

Examination made on March 2, 1923 revealed the following: General examination of patient negative. Examination of left arm: The elbow was held in right-angle flexion, and there was about 50 degrees of motion present. There was a definite wrist-drop with absolutely no power in the extensors of the wrist. The proximal phalanges of the fingers could be extended, movement being accomplished by the lumbricales and interossei muscles, which are supplied by the ulnar nerve (Fig. 805). The sensation was normal except over the dorsal surface of the thumb (radial distribution), where it was definitely depressed, and over this area tingling sensations were noted. There were no trophic changes of the skin or nails. The Wassermann, other blood tests, and urine examination were negative. The *x*-ray taken at this time showed a perfectly reduced supracondylar fracture of the left humerus, with very little callous formation.

The character of the injury, together with a paralysis of the extensor muscles of the wrist, fingers, and thumb (posterior interosseus nerve), and interference with sensation over the dorsum of the thumb (radial), indicated an injury to the musculospiral nerve (radial), above its division into the posterior interosseus and radial. Exploration of the musculospiral nerve at the point of fracture was advised.

Operation was performed on March 3, 1923. The musculospiral nerve was exposed through a 4-inch incision over the inter-

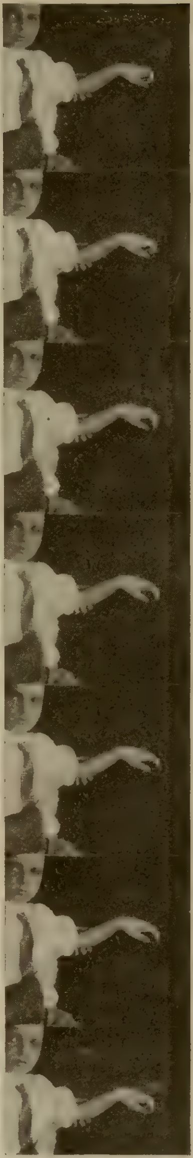


Fig. 805.—The hand and arm at the time of operation, showing the complete loss of extension of the wrist and the diminished movements in the fingers.

space between the brachialis anticus and the brachioradialis. The nerve was found to be embedded in dense scar tissue from the point of its division into the posterior interosseus and radial upward for a distance of 2¾ inches. The nerve was stimulated with a weak current above the point of compression with no response in the muscles supplied, demonstrating that there was interference with the conductivity of the nerve.

The nerve, with considerable difficulty, was dissected free from the scar tissue, when it was found to be hard, sclerotic, and very much diminished in size. The sheath of the nerve was split and dissected free (neurolysis). This was over a distance, as mentioned, of 2¾ inches. The nerve was then buried in the fibers of the brachialis anticus muscle and the wound closed by layers. A cock-up splint was applied, with thumb completely extended and abducted.

Two days later patient claimed that the thumb felt natural for the first time since shortly after the injury. Within ten days the patient was able to hold his fingers in extension, and slight contraction of the extensor muscles of the wrist could be felt. April 9th (thirty-seven days after operation), as you see the patient, he has complete return of function of the thumb, about 75 per cent. of normal extensor power in the fingers, and about 25 per cent. return of power in the extensors of the wrist (Figs. 806, 807). Sensations over the radial distribution are normal. Patient is still wearing cock-up splint.

At operation there was no evidence that the nerve had been injured by the fractured ends of the bones. It was, however, completely surrounded and compressed by dense scar tissue which was responsible for the interference with its conductivity. As the first symptoms of nerve involvement were noted forty-eight hours after the injury and the wrist-drop came on even later, we are justified in assuming that the nerve injury was a progressive one and due to pressure. We believe that this pressure was due to the extravasation of blood and exudate following the injury, and that this pressure was probably increased when the elbow was placed in acute flexion.

If we bear in mind that given severe hemorrhage and much

Fig. 806.—W. N. After operation. Note the action and control of the fingers.

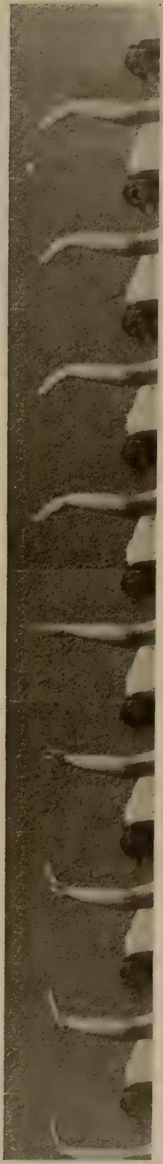


Fig. 807.—W. N. After operation. Note the action of the flexors and extensors of the wrist.

inflammatory exudate, we can have a tremendous increase in pressure within the deep fascia which encloses the extremity in a complete fibrous envelope, and if we remember also that the easily injured nerve trunks and fibers are exposed to this compressing force, it is rational to conclude that definite and even permanent injury to the nerves may result. This is what seems to have happened in this case, and what probably happens to a minor degree in many fractures. This condition is much more likely to complicate fractures in the vicinity of joints, as here the nerve lies in closer proximity to the bone, and is surrounded by tendons and dense fibrous tissue which allow little room for expansion. Later the replacement of the blood-clot and exudate by scar tissue brings about further permanent compression and continued interference with the conductivity of the nerve or nerves involved. While it is possible under such conditions that recovery in part of an involved nerve may occur, it is certain that the recovery will be extremely slow and probably incomplete. Operative interference after a reasonable time in such cases is clearly indicated, as it shortens the convalescence by many months and probably results in a far more complete recovery.

Case III.—Mrs. W., aged seventy years. On November 10, 1919 patient fell forward on her right hand and forearm, sustaining a fracture of the right wrist. Patient states that there was considerable swelling about the wrist and marked discoloration of the skin. *x*-Ray plates taken at that time showed a typical Colles' fracture of the right wrist, with only slight displacements of the fragments and no impaction. The fracture was reduced within a few hours of the injury and treated on a straight board splint for eight weeks without massage or manipulation. When the splint was removed the wrist was stiff, painful, and the patient had practically no use of the hand. She was then told to use the wrist, which she attempted to do for several weeks, with no improvement of function and increasing pain in the wrist, which radiated into the fingers.

On January 27, 1920 she consulted us, and our examination is recorded as follows: Patient was a very healthy individual for her age, revealing no positive general physical findings of note. The right wrist showed marked limitation of motion, chiefly dorsal flexion. All the phalangeal joints were stiff, swollen, and painful. Passive movements of the wrist- or finger-joints caused the patient agonizing pain which originated in the wrist and shot upward into the forearm and down the hand into the fingers, particularly noticed in the little and ring fingers. While this pain was aggravated by motion, patient stated that she had constand pain day and night. The sensations over the hand and wrist were normal except a hyperesthesia of the little and ring fingers, which evidenced itself by severe shooting pains when these members were touched.

x-Ray taken at the time of this examination showed a complete reduction of the fracture; in fact, the reposition of the fragments was so good that it would have been difficult to diagnose a fracture if the original plates had not been available.

It was thought best to observe this condition for a few weeks, so the hand was put up in hyperextension and heat and massage used daily. This treatment was continued until May 8, 1920, a period of five months, without improvement; but, on the contrary, increasing pain, which was of an intense shooting character and was chiefly localized in the little and ring fingers and on the dorsum of the wrist. The patient stated that the pain was constant and that she was getting no rest day or night. As the patient had not been under very close observation during the six weeks preceding, another examination was made.

The following additional findings were noted at this time: There was marked hyperesthesia over the little and ring fingers. Trophic changes were noted in the nails of all fingers, but not on the thumb. The skin over the little and ring fingers was smooth and presented a glazed or glossy appearance (Fig. 808). There was also some sweating, which was confined to these two fingers. Slight atrophy of the hyperthenar eminence was noticed. The joints of the middle, ring, and little fingers were very stiff and were held in slight flexion. On attempt of movement of these fingers the pain was very severe. No muscular paralysis was found. As the symptoms indicated some involvement of the ulnar nerve and probably of the median nerve also, an exploration of the nerves at the wrist was advised.

At operation, on May 26th, the ulnar nerve was exposed at the wrist and was found to be compressed by a rather thick band of adhesions over an extent of about 1 inch. These adhesions were dissected free and the nerve, when isolated, was found to be definitely diminished in diameter at this point. The sheath was thickened and sclerotic. A neurolysis was done. The median nerve was then inspected through the same incision and was also found to be compressed by a much smaller band of adhesions. These were removed and a neurolysis of the constricted nerve was done. The incision was closed by layers. No splint was applied.

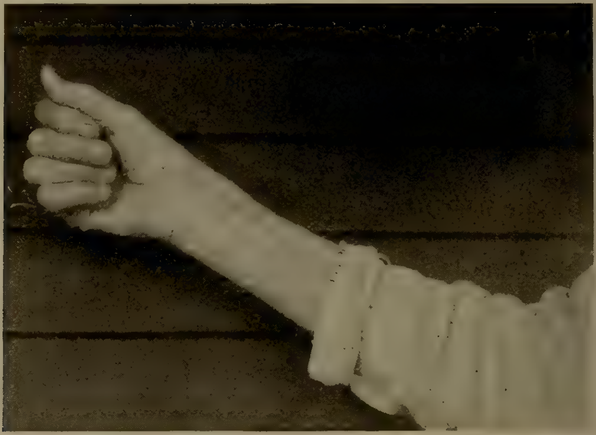


Fig. 808.—Showing the flexion deformity in this case before operation.

For three days following the operation the patient suffered intense pain throughout the entire hand and wrist. This rapidly subsided, and when seen in August, two months later, the patient was practically well. There was no pain present over the old distribution, but she did have an occasional shooting pain over the middle finger after prolonged use of the hand. The motions of the wrist were practically normal. The movements in all the fingers were good, except some stiffness in the middle finger (Figs. 809, 810). She was using her hand freely, and stated that she was doing her own housework, also knitting and crocheting. What little disability remained in the hand might well be considered as no more than would be expected from Colles' fracture in a woman of this age.

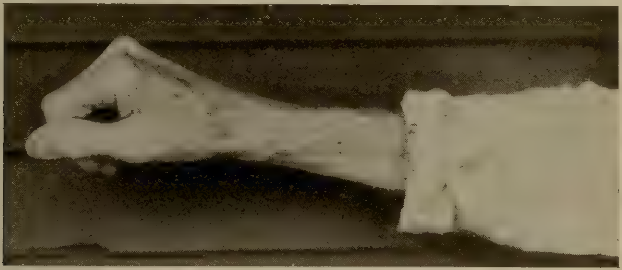


Fig. 809.—After operation. The range of flexion of the hand.

In the light of the symptoms and findings at operation what probably occurred in this case was the following: At the time of the fracture there was a large extravasation of blood and lymph. This was evidenced by the severe swelling and discoloration of the skin and impressed the patient from the onset. The arm was then treated on a flat splint for eight weeks without motion.

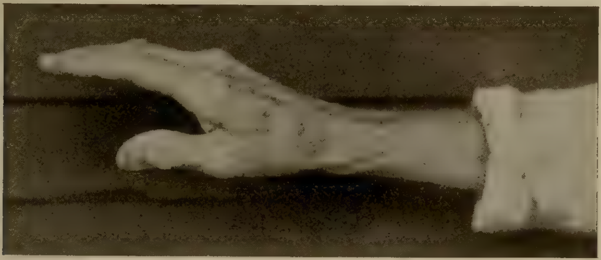


Fig. 810.—After operation. The range of extension of the hand.

The position and long immobilization favored an accumulation of hemorrhage and exudate on the palmar surface of the wrist and around the region of the median and ulnar nerves. As this exudate organized adhesions were formed about these nerves. The gradual contractions of these bands of fibrous tissue caused increased pressure on the nerves and an irritation of the fibers.

As a result we had the severe radiating pain which is aways associated with pressure on a nerve or nerve trunk (causalgia). In this instance the pressure was not severe enough to cause an interruption of the conductivity of the nerve, hence no muscle paralysis resulted. It was sufficient, however, to cause an irritation which expressed itself in pain and trophic disturbances, as the shining skin, localized sweating, and changes in the appearance of the nails.

This case was very instructive to us, as it emphasized a condition commonly seen in war surgery, where we have a distinct involvement of a nerve in an injury without muscle paralysis. This condition probably occurs in conjunction with fractures frequently, but fortunately most of them recover spontaneously.

Case IV.—Mrs. S., aged twenty-four years. At the age of six years patient was struck on the right leg by a falling gate, fracturing both bones of the leg at the junction of the middle and upper third. Within an hour the entire upper half of the leg was markedly swollen and very blue. No deformity of the foot or ankle was noticed at this time, and it was thought that the injury was totally confined to the upper part of the leg. The family physician was immediately called, he reducing the fracture, and placing lateral board splints on the leg. At the end of nine days these were removed, at which time several large pressure sores were found in the upper third of the leg on the superior surface and on the sides. These became infected, and a great deal of purulent material exuded for the next week or ten days. When the splints were removed patient says she noticed that the foot seemed to turn in, and she did not have the muscular control of the foot that she should. She gave no history, however, at that time of sensory disturbances other than to say that foot seemed numb and lifeless. At that time she thought that the ankle had probably been dislocated in the accident. Without treatment other than rest and antiseptics to the pressure sores the fracture rapidly healed, as also did the infected wounds, and at the end of six weeks patient was told to walk, but said she could not bear the weight of her body on this leg on account of the inversion and weakness in her foot and ankle. She hobbled about for some months, however, with the aid of a crutch, after which time a brace was applied to hold the ankle and foot. This she wore for twelve years. During the past six years patient has worn no support, and she states that the inversion deformity of the foot has been gradually growing worse.

Examination of the patient on May 12th revealed a healthy young woman, whose general and laboratory examinations were

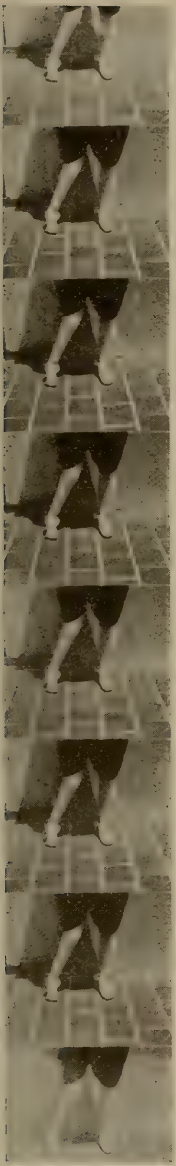


Fig. 811.—The leg at the time of operation showing the deformity and the lack of motion.

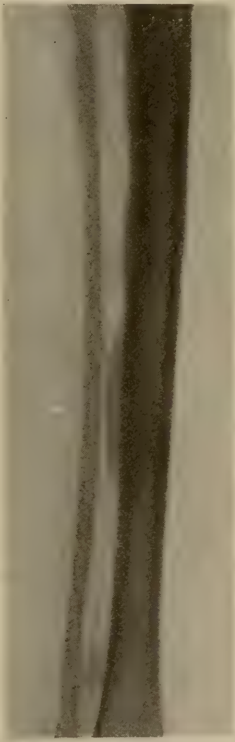


Fig. 812.—The x-ray of this case at the time of examination.

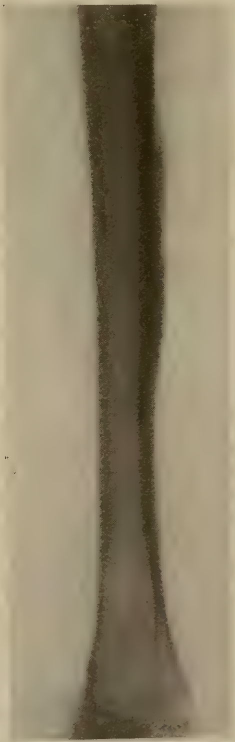


Fig. 813.—Note the periosteal outgrowth.

essentially negative. She walked with a limp and a rather marked equinovarus deformity was noted. There were three rather large scars on the upper third of the right leg, the sites of the old pressure sores. The upper third of the leg was about normal in size, but from the junction of the middle and the upper third down the leg was very small and withered, and the foot was held in an equinovarus position (Fig. 811). The perineal muscles were entirely paralyzed and no action could be obtained in the extensors of the toes or foot. There was slight power in the flexors of the toes and a moderate amount of action in the gastrocnemius and soleus. The heel tendon was markedly contracted. There was little sensory disturbance on the skin of the leg or foot. *x*-Ray taken at this time showed a perfectly reduced fracture of the tibia and fibula at the junction of the middle and upper third. About 2 inches below the site of the fracture on the tibia was noticed a calcareous deposit which looked very much like a periosteal outgrowth and extended anteriorly and laterally over a length of 3 inches (Figs. 812, 813).

Considering the history and the paralysis below the point of fracture a diagnosis of compressive trauma to the posterior and anterior tibial nerves was made, and an exploration of these nerves was advised before considering any work on correcting the deformity of the foot.

Operation (May 16th): A linear incision was made on the outer side of the crest of the tibia (right), extending from the level of the fracture down about 8 inches. The anterior tibial muscle was so trophic that few fibers could be found. The anterior tibial nerve was dissected out in the upper portion of the incision and was found to be normal in size and consistency. The nerve was then followed down and gradually began to diminish in diameter and its consistency became firm. In the middle third the nerve turned abruptly inward and entered the bony growth which was noted on the *x*-ray plate. This growth was hard, flaky, and seemed to be attached to the tibia, but could easily be shelled out with the handle of the scalpel (Fig. 814). The nerve at this point was very small in diameter and the bony flakes seemed to be incorporated in the sheath. With great difficulty the nerve was dissected out and followed on down. Below this growth the nerve was very small in diameter and flabby in consistency and dark in color. The nerve was dissected out 2 inches further, then, after a neurolysis, the nerve was transplanted in the few remaining muscle-fibers of the anterior tibial. The incision was then closed by layers.

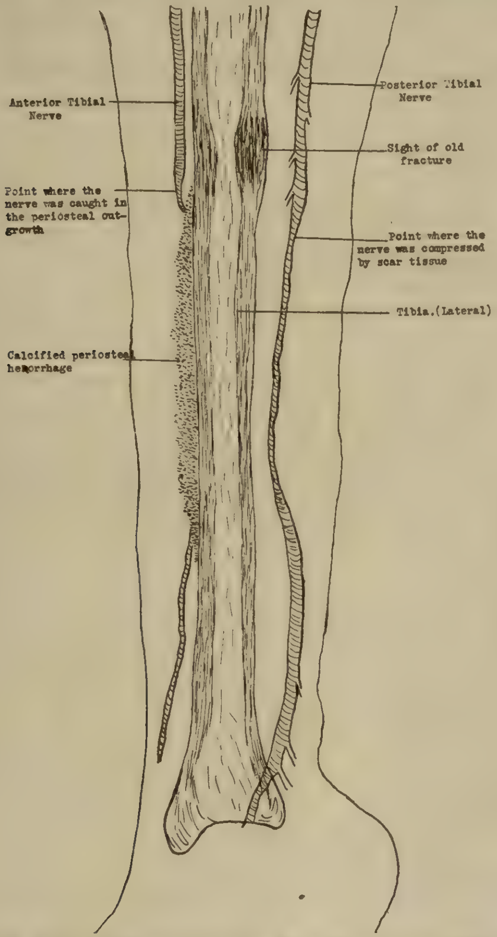

Anterior Tibial Nerve
Posterior Tibial Nerve
Sight of old fracture
Point where the nerve was caught in the periosteal outgrowth
Point where the nerve was compressed by scar tissue
Tibia.(Lateral)
Calcified periosteal hemorrhage

Fig. 814.—A diagram made at the time of operation.

An incision was then made in the midcalf from the junction of the middle and upper third, running down 6 to 8 inches. The incision was carried down through the atrophic gastrocnemius and soleus muscles and the posterior tibial nerve dissected out. As the nerve was followed down, it diminished in size and became very sclerotic and the sheath was thick and fibrotic. Dense fibrous tissue enveloped the nerve just below the point of fracture and for a distance of about 2 inches. The nerve was dissected free from this tissue and a neurolysis done. The nerve was then transplanted into fibers of the posterior tibial muscle and the incision closed by layers.

Within three days patient had appreciably more power in the flexors of the toes and the heel tendon was very active. It is very doubtful whether this patient will gain much from this operative procedure, as the muscles of the anterior leg were very atrophic. We do, however, expect some regeneration of the muscles of the leg.

This patient is shown as an extreme case, demonstrating what marked deformity can occur following an injury to a nerve or nerves resulting from a fracture. The symptoms of nerve injury came on very early in this case, eight days after the accident, and if they had been recognized at that time, it is almost certain that this young lady would not have suffered this crippling deformity. The compressive trauma in this case was undoubtedly due to hemorrhage, as the nerves were compressed below the site of the fracture. The compression of the anterior tibial was doubtless due to an organized periosteal blood-clot which became calcified (Fig. 815).

Considering these 4 cases as typical of injuries which peripheral nerves may suffer in association with fractures, there are several points they suggest which we might properly emphasize.

First: Three of the injuries were in the neighborhood of a joint; the elbow in the first two cases, and the wrist in the third case. Our experience leads us to conclude that fractures near a joint are more likely to be complicated by nerve injuries than those along the shaft of bones. The majority of nerve injuries we have seen have been found in fractures about the elbow, with some very interesting ones associated with wrist fractures.

When we recall that the large nerves and arterial trunks lie in closer proximity to the bones in the joint region than they do along the shaft (except the musculospiral); that fractures in the region of joints are usually due to direct and severe trauma, and that here the nerve and arterial trunks are surrounded by compact and firm tendons, structures which do not permit of much expansion in the presence of a large hemorrhage and exudate, we have a rational explanation of the compressive injury which may occur.

Second: How long should we wait before exploring nerves which have been injured in conjunction with fractures? While we do not advocate the ruthless exploration of every fracture which is accompanied by signs of nerve injury, as many of the mild cases recover spontaneously, we do believe that there has been too much tendency to follow a waiting policy in such cases, as you will note in Cases III and IV. In Case III the woman was allowed to undergo a great deal of pain needlessly for observation, and we have now come to the conclusion (this being one of our first cases) that the waiting policy is needless after a definite diagnosis is made. It seems rational that given a fracture with definite

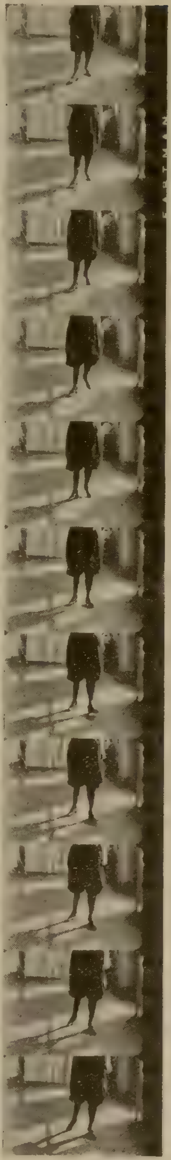


Fig. 815.—Patient after operation. The deformity of the foot was corrected.

signs of nerve involvement of such a character as to cause distinct interference with the function of the part or to cause severe pain, a month or two at the outside is all the time that should be allowed to elapse before exploring the nerve, unless there has been very definite signs of improvement. If there has been a real injury to the nerve, there is nothing to be gained by procrastination; delay will only allow of a more extensive degeneration of a nerve and trophic changes in the muscles, with a very prolonged and probably permanent disability. If sufficient pathology is not found to require neurolysis or nerve suture, no harm has been done, and definite assurance can be given the patient of his ultimate recovery.

Third: The economic importance of peripheral nerve injuries with fractures is great. If the nerve lesion is overlooked, an injury which properly treated should incapacitate only a few months, may result in many months of disability and perhaps a permanent one. One hesitates to estimate the amount of money expended each year in compensation and medical care in cases where nerve injuries have been overlooked. Too often the attending physician focuses his attention upon the displacement of the fractured bones and their anatomic reposition as shown by the *x*-ray. In doing this he fails to carefully examine the injured part for associated nerve injuries, with the result that when the dressings are removed he finds an impaired extremity with months of treatment and probably operative interference necessary before a useful part can be secured.

Let us, then, get accustomed to looking at a fractured extremity as an injured part which is made up of muscles, blood-vessels, and nerves, as well as bone, and to treat it not to get an anatomic reposition of the fracture, but to get a good, functioning member.

AN OPERATION FOR THE RELIEF OF ANKYLOSIS OF THE HIP-JOINT

MISS C., aged thirty-four years. This patient presented herself for an examination to ascertain whether she could gain any relief from disability due to ankylosis of the right hip. Her history was as follows: The trouble began at the age of four years, with pain in the right hip. The pain gradually grew worse and she began to limp. Tuberculosis of the right hip was diagnosed and she was put on an extension hip-joint brace. She wore the brace for some time, and then, as the hip improved, the brace was discarded. When patient was seven years old the hip had contracted into a position of adduction and flexion and was bothering her in her walking, so she was taken to a surgeon, who operated upon her. As nearly as can be determined the adductor tendons were divided and the limb put up in plaster in abduction. Plaster cast was left on for six months, and when it was removed there was considerable improvement in the position of the hip. As time went on, however, the deformity gradually returned and became so marked that she was compelled to wear an extension shoe, which she has worn for twenty years.

Examination on April 6, 1922: Patient was a well-nourished healthy adult, who walks with a marked limp. Her occupation was that of a school-teacher, which necessitated her being on her feet for a large part of the day. While she could get about well with an extension shoe and by using a cane, her right limb became very tired, and she had so much pain and backache at the end of the day that she feared she would have to give up her position. There was no pain in the hip-joint other than that due to the position in which she walked. Heart, lungs, and kidneys normal. All blood tests and urine examinations negative.

Examination of right hip: The right hip-joint was ankylosed in a position of 70 degrees flexion and 40 degrees adduction. The right leg was about 6 inches shorter than the left, although it was impossible to give exact measurements because of the extreme deformity. She was wearing a 5-inch extension shoe.

Examination of spine: When standing, a definite lordosis and a marked left lumbar and slight right dorsal spinal curvature was present. The whole lumbar region was tender and there was marked spasm of the spinal muscles. Patient limped very distinctly in walking and each step caused a certain amount of discomfort after some exertion. *x*-Ray of the hip showed a complete destruction of the head of the right femur and bony ankylosis with the pelvis (Fig. 816).

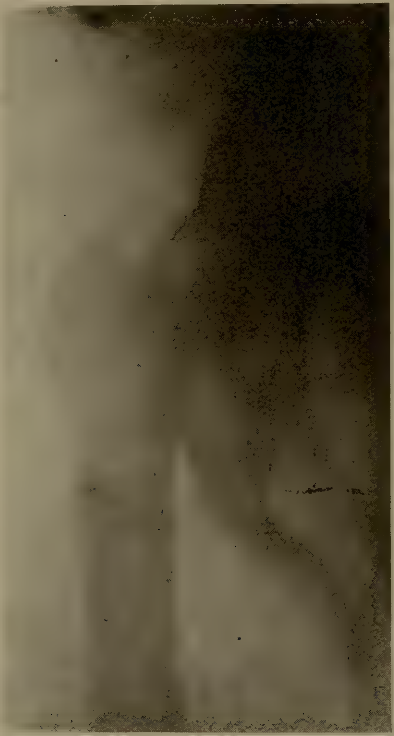
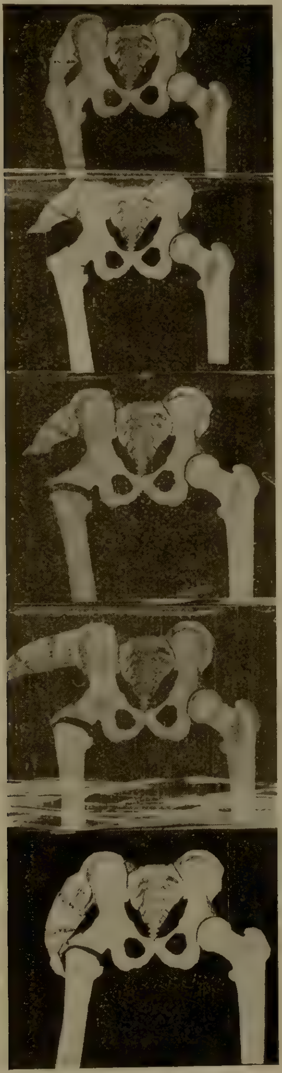


Fig. 816.—*x*-Ray in this case before operation. Note the complete bony ankylosis.

This case presented the problem of attempting to relieve severe pain in the right side and back, which was becoming severe enough to threaten her ability to earn her livelihood. It was explained to the patient that the back pain, which was really her gravest symptom, was due to the distortion of the spine, which, in turn, was dependent upon the deformity of the hip-joint. She was informed that the only way in which this could be overcome would be by an operative procedure upon the ankylosed hip-joint, with the idea of correcting its position.

Three procedures were considered: one, a subtrochanteric osteotomy; two, arthroplasty upon the hip-joint; three, the formation of a new joint below the site of the original joint in the trochanteric region. The objection to the first method was that if successful it would leave her with a straight, stiff hip, which would make sitting at a desk difficult and cause considerable back strain, the very condition we wished to eliminate. The second procedure presented grave difficulties, as the destruction of the head was so complete as to leave little material for forming a new one; and, in addition, it did not seem advisable to do an arthroplasty upon a tuberculous joint, as there might be a possibility of relighting up the old process. The third procedure, that is, forming a pseudarthrosis in the trochanteric region, seemed the most promising, as it would overcome the flexion and adduction, decrease the shortening to a large extent, and give her a movable joint if successful. The possibilities of the operation as to success and failure were explained to the patient, and she willingly submitted to the operation.

Operation (July 10, 1922): The hip was exposed by an incision running from the anterosuperior spine to the posterior portion of the great trochanter, and then passing downward along the posterior margin of the femur, making an oblique angle. This incision allowed the head and neck of the femur to be easily exposed by working down between the gluteus medius and tensor fascia femoris. The incision was then prolonged upward and backward to the upper margin of the great trochanter. The tip of the trochanter, with its attached muscles, the gluteus medius and minimus, was then removed with an osteotome and turned back (Fig. 817). An osteotomy through the trochanter was then done, in the form of an arc of a circle, about $\frac{1}{2}$ to $\frac{3}{4}$ inch of bone being removed. The adductors were then divided subcutaneously and the leg brought down into complete extension and abduction. The bone surfaces were then carefully rounded off and a shelf turned down from the upper fragment to afford a



1. A diagram of the hip in this case drawn from the *x*-ray plate. Note the destruction of the joint and the head of the femur. Complete bony ankylosis.

2. The great trochanter with the insertion of the gluteal muscles is turned back.

3. A trochanteric osteotomy is then performed and the bone ends smoothed and a joint fashioned.

4. A shelf is then turned down, and a piece of Baer's membrane inserted between the ends of the bones.

5. The great trochanter is then made fast to the upper end of the femur. The leg is put up in abduction with about 15 pounds of traction.

Fig. 817.—The steps of the operation in this case.

more cup-shaped articular surface. A piece of Baer's membrane was then carefully sutured around the distal fragment, which now corresponded to the head of the femur, without any neck. The tip of the trochanter with its attached muscles was next brought down and fastened to the distal fragment and the incision closed by layers. A drain of rubber tissue was put in and left two days.

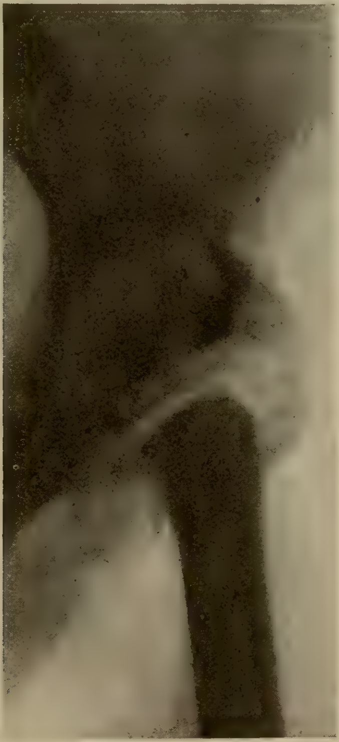


Fig. 818.—The *x*-ray plate after operation.

The patient was immediately put upon a Bradford frame with 12 pounds of traction, with the leg in abduction. Stitches were removed in eight days and incision closed entirely, except at one point where there was a little drainage. Passive motion was begun on the tenth day. By the beginning of the third week the patient commenced to move the hip herself, and from this time on active and passive motions were used daily. At the end of six weeks patient was allowed up on her feet with crutches, and Buck's extension was applied whenever she rested and during the night. It was noted at this time that the motion was very good and that there was very little pain in the hip, even after considerable use. At the end of two months the crutches were discarded and the patient walked very well with a cane, with no backache and practically no trouble with the hip. Patient was then allowed to go home.

As you see the patient now she has about 50 degrees of normal motion in all directions in the hip-joint (Fig. 818). Patient walks with ½-inch elevation on her heel. She can go up and down steps with ease and is living practically a normal life. There is at this time about 2½ inches difference in the two legs.

We feel that we have done this girl a great deal of good, in that she can walk at the present time without an extension shoe; her back is practically straight and pain free. She has motion in the hip and the hip is not painful, and she has been able to resume her occupation as a school-teacher.

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